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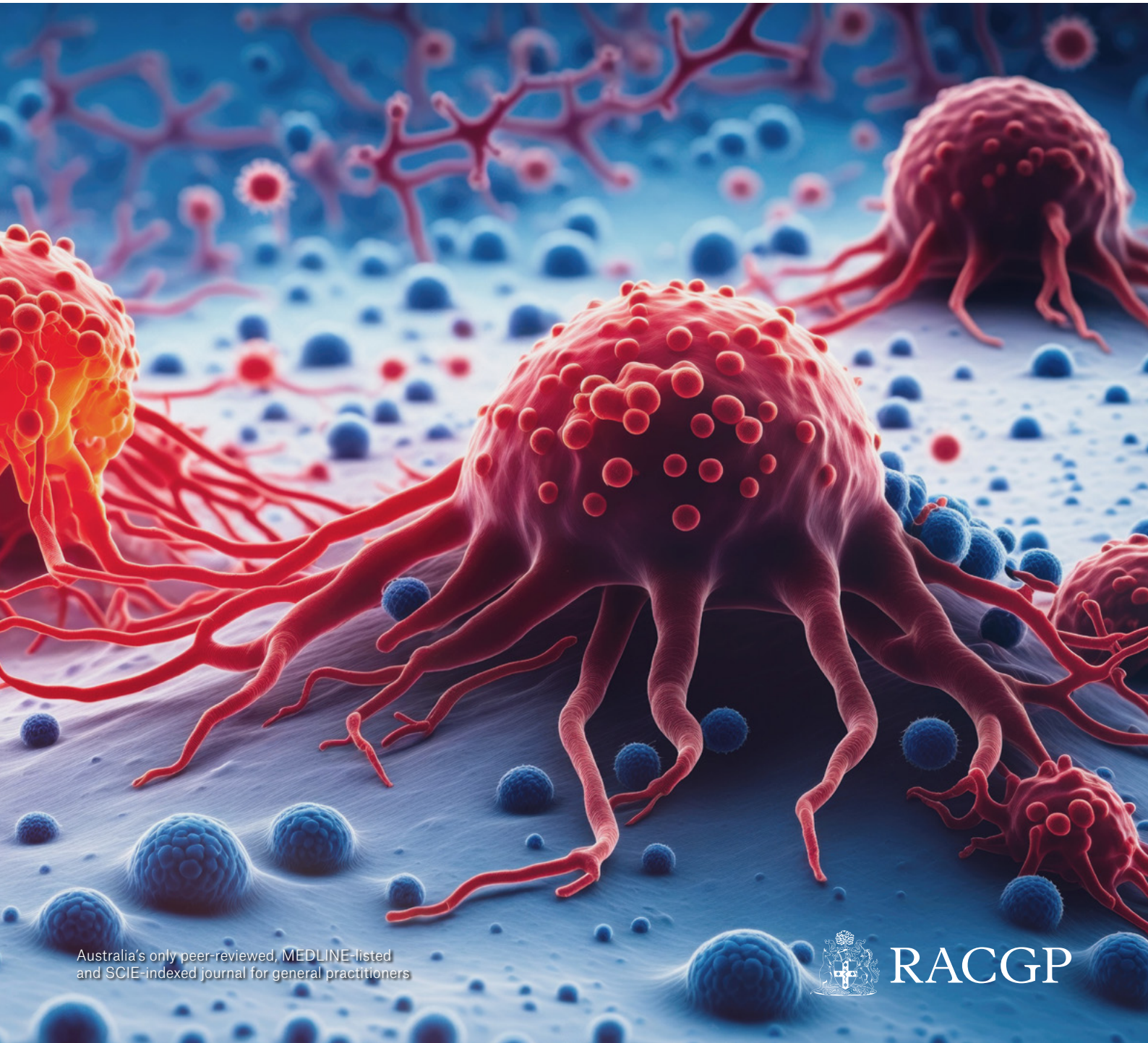

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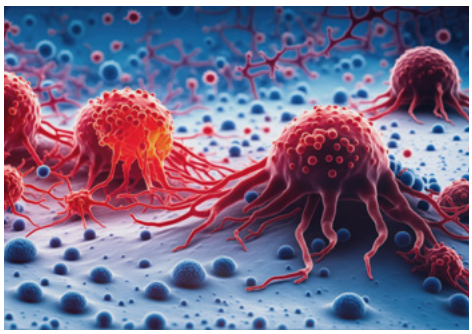

Cancer and chronic disease

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Editorial office

The Royal Australian College of General Practitioners Ltd
100 Wellington Parade
East Melbourne, Victoria 3002
Wurundjeri Country

T 03 8699 0414 F 03 8699 0400 E ajgp@racgp.org.au

www.racgp.org.au/ajgp

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We acknowledge the Traditional Custodians of the lands and seas on which we work and live, and pay our respects to Elders, past, present and future.

Contents

A clinical approach to chronic respiratory disorders in Aboriginal and Torres Strait Islander Australians in primary care

Subash S Heraganahally, Timothy Howarth, Winnie Chen

Background
Chronic respiratory disorders in the adult Aboriginal and Torres Strait Islander population are common, but there is a sparsity of literature detailing an approach to clinical management.

Objective
This paper describes a clinical approach to chronic respiratory disorders for clinicians working with Aboriginal and Torres Strait Islander people, particularly in the remote Australian context.

Discussion
There are significant differences in the way chronic respiratory diseases manifest in Aboriginal and Torres Strait Islander people compared with non-Indigenous Australians. Chronic obstructive pulmonary disease (COPD), bronchiectasis and asthma often overlap in clinical features, and can be present concurrently. Restrictive impairment on spirometry is common. The presence of bronchodilator response might indicate asthma, but can also be observed in patients with asthma/COPD/bronchiectasis overlap. Because the management of each of these conditions differs, accurate diagnosis and disease severity classification are important, particularly in the prescribing of guideline-recommended inhaled pharmacotherapy.

ABORIGINAL and Torres Strait Islander adults have a higher prevalence of chronic respiratory conditions compared with the overall Australian population.[1] The high prevalence of disease is underpinned by a history of colonisation and racism, the effects of which continue today alongside intergenerational trauma and disadvantage.[2] Coupled with the difficulties of overlapping conditions complicating diagnosis are difficulties in accessing specialist care and challenges associated with a transient primary healthcare workforce in remote communities. In the Northern Territory (NT), over 30% of the population self-identifies as Aboriginal and Torres Strait Islander, with most of these people living in remote areas.[3] Due to impaired access to specialist respiratory healthcare and workforce shortages in remote and rural Aboriginal communities, this paper, based on our experiences in the NT,[4–7] aims to provide a brief guide on the approach to chronic respiratory disorders that might be of use for primary care nurses, Aboriginal health practitioners and medical practitioners working in rural/remote Australia.

History and examination

Demographics and history

In primary care, Aboriginal and Torres Strait Islander adults with chronic respiratory disorders typically present at ages 40–60 years,[4] with a marginally higher female representation (57%) and a higher prevalence in remote compared with urban areas.[5] Shortness of breath is one of the most common presenting symptoms (in approximately 62% of patients), followed by productive cough (30%), which is more commonly reported among patients with underlying bronchiectasis[8–10] (refer to Table 1 for a comparison of history and examination findings). In addition, details of past respiratory medical history, hospitalisations, family history and other relevant medical comorbidities, including smoking and cannabis/vaping use, should be considered. The annual Aboriginal and Torres Strait Islander health check (Medicare Benefits Schedule Item 715) is an appropriate opportunity for these screening questions to be asked.

Physical examination findings

There is a paucity of literature describing common respiratory examination findings in Aboriginal and Torres Strait Islander Australians. Reduced breath sounds on auscultation might be related to poor respiratory efforts without underlying respiratory conditions or might indicate the presence of COPD. Reduced breath sounds along with crepitation or crackles might be suggestive of associated bronchiectasis.[11] Chest auscultation findings of rhonchi/wheezing might indicate the presence of asthma or might also indicate the presence of chronic bronchitis, bronchiolitis, small airway disease or asthma/COPD overlap.[12,13]

Table 1. Clinical features and management of chronic respiratory conditions in Aboriginal and Torres Strait Islander people

	COPD	Bronchiectasis	Bronchiectasis/COPD	Asthma	Asthma/COPD
Clinical parameters					
Smoking history	++++	++	+++	+	+++
Cough	++	+++	+++	++	++
Sputum production	++	++++	+++	+	++
Wheezing	+	+	+	+++	++
Shortness of breath	+++	++	+++	+	++
Chest auscultation	Reduced breath sounds	Crackles	Reduced breath sounds and crackles	Rhonchi	Reduced breath sounds and rhonchi
Radiology	Emphysema/airway inflammation	Bronchiectasis changes	Emphysema and bronchiectasis changes	Normal or airway inflammation	Airway inflammation/ emphysema
Spirometry	Obstructive pattern	Restrictive pattern	Obstructive and restrictive pattern	Normal or obstructive or restrictive pattern, with bronchodilator response	Obstructive or restrictive pattern, with bronchodilator response
Medications					
SABA/SAMA[A]	+	+	+	+++	++
LABA/LAMA[A]	++	+	++	+++	++
ICS[A]	+	Caution[B]	Caution[B]	+++	++

Note: this is a general guideline only. Individual patients' scenarios and clinical judgment should be taken into consideration in clinical decision making.

[A]Could be considered.

[B]Caution: extreme caution has to be exercised in using inhaled corticosteroids (ICS).

++++, extremely likely; +++, more likely; ++, likely; +, less likely; COPD, chronic obstructive pulmonary disease; LABA, long-acting β_2 agonists; LAMA, long-acting muscarinic antagonists; SABA, short-acting β_2 agonists; SAMA, short-acting muscarinic antagonists.

Findings of squeaks might suggest hypersensitive pneumonitis, small airway disease or bronchiolitis.[14] Further, collecting vital signs and other relevant physical examination details is critical.[15] Finger clubbing might also be observed (Figure 1). The causes of clubbing in other ethnic populations are typically well established and/or multifactorial.[16] However, among Aboriginal and Torres Strait Islander people, conditions that could be responsible for clubbing are not well described in the existing literature.

Investigations

Lung function tests

To date, spirometry reference norms have not been well established for older Aboriginal and Torres Strait Islander adults.[17] There is ongoing controversy regarding the need and utility of ethnicity-specific references for spirometry. The differences seen in spirometry between ethnicities are more likely due to social constructs resulting in early life disadvantage, such as prematurity, passive smoking and/or ongoing early lower respiratory infections.[18,19] Nonetheless, spirometry is a useful tool and plays an integral role in diagnosis, assessment of disease severity and in monitoring and guiding therapeutic interventions. A recently published study applied non-Indigenous references for spirometry and showed that only 10–12% of Aboriginal and Torres Strait Islander patients displayed normal-range spirometry parameters for forced expiratory volume in one second (FEV_1) and forced vital capacity (FVC).[20] In contrast, the FEV_1/FVC percentage predicted values tended to be within the normal range (95–97%).[20] Restrictive or mixed ventilatory impairment is the most common spirometry pattern observed among many Aboriginal and Torres Strait Islander patients, including patients with bronchiectasis (Figure 2). However, an obstructive pattern could be observed among patients with predominant COPD.[20] Bronchodilator response could be observed in up to 17% of patients.[12] Concurrent respiratory comorbidities are common among Aboriginal and Torres Strait Islander patients presenting with respiratory symptoms, and therefore spirometry might be non-specific, and mixed impairments must be considered in the context of multiple symptoms.[12,20,21]

The lack of normative values for Aboriginal and Torres Strait Islander adults is especially important when using spirometry severity

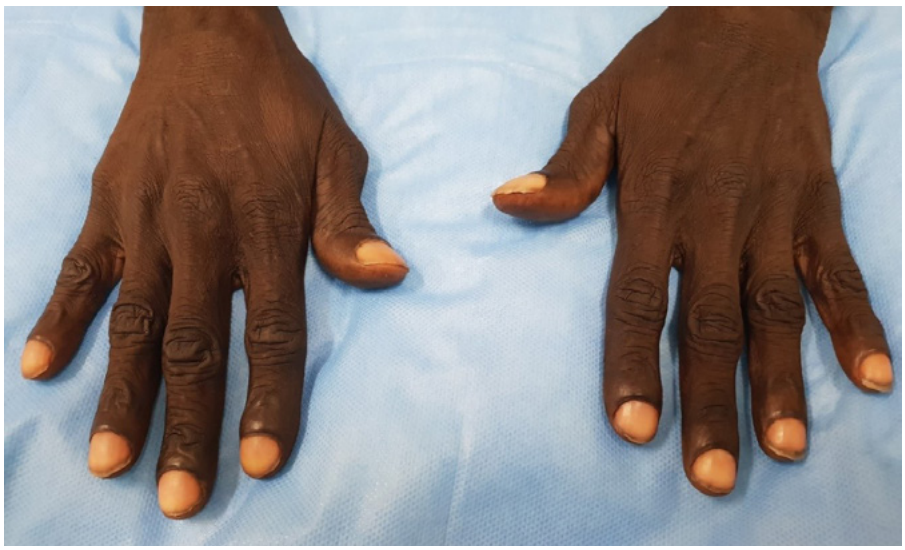


Figure 1. Finger clubbing in a Aboriginal and Torres Strait Islander patient. Informed consent was obtained from the patient to publish the photograph.

grades to guide pharmacotherapy (eg in using the Australian COPD concise guidelines [COPD-X]).[22] Moreover, it is critical to acknowledge that the COPD-X guidelines have not been extensively validated in the wider Australian Aboriginal and Torres Strait Islander populations. When using non-Indigenous reference norms, the majority of Aboriginal and Torres Strait Islander patients with COPD undergoing spirometry testing can be classified as having severe or very severe airflow obstruction.[23] Therefore, by adopting the COPD-X guidelines, most patients are likely to be prescribed inhaled corticosteroids (ICS), which might not be appropriate in certain circumstances, such as in the case of concurrent bronchiectasis.[24] Given the lack of Aboriginal and Torres Strait Islander-specific spirometry reference values, the FEV_1/FVC ratio might be a better parameter to assess airway impairment alongside culturally specific assessment of impacts on quality of daily life.[24] Furthermore, patient understanding and cooperation are extremely important to accurately assess spirometry.[25] A previous study among rural and remote Aboriginal and Torres Strait Islander residents demonstrated that only 42% of lung function tests were acceptable for session quality.[26] Adequate support and resourcing for primary care clinicians to conduct routine spirometry might be difficult. Resources such as the Indigenous Spirometry Training Workshops (www.health.qld.gov.au/__data/assets/pdf_file/0023/437153/srcn-iroc-workshop.pdf) can be useful for clinicians upskilling in remote clinics.

Chest radiology

Chest radiology is integral to the diagnosis and management of several respiratory conditions, with chest computed tomography (CT) being increasingly used for this purpose. However, chest CT is not easily accessible in remote communities. In these circumstances, a chest X-ray (CXR) might be a reasonable alternative option. Assessed against the gold standard of a CT scan, the combination of CXR and spirometry has shown a sensitivity of 74% and specificity of 72% in diagnosing airway disease in remote Aboriginal and Torres Strait Islander patients, compared with a sensitivity of 62% and specificity of 77% when using spirometry alone.[21] Nonetheless, a recent study on chest CT scans confirmed that complex and concurrent chest radiological abnormalities are highly prevalent among Aboriginal and Torres Strait Islander respiratory patients,[27] such as advanced emphysema, bronchiectasis and cystic lung disease.[28] When feasible and available, yearly CXR might be helpful in chronic lung disease to monitor progress and for the early diagnosis of any new lung conditions, such as malignancy. However, if patients have a clinically judged need for a chest CT, it should be facilitated. The implications and feasibility of the proposed rollout of a lung cancer screening program among Aboriginal and Torres Strait Islander people in remote communities are yet to be determined.[29] Currently, the presence of non-malignant lung nodules and lymphadenopathy are frequent chest CT findings in this population.[30,31]

Sputum microbiology

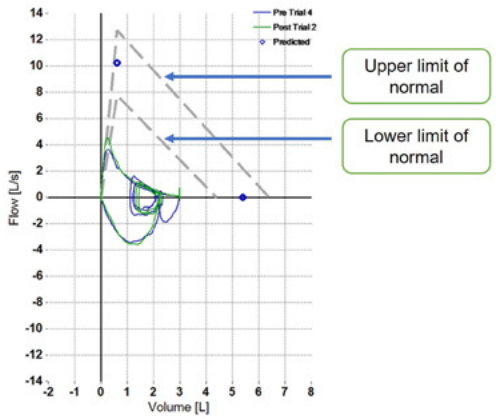
Sputum microbiology data are limited among the adult Aboriginal and Torres Strait Islander population, including among patients with bronchiectasis. Common organisms cultured among patients with chronic respiratory disease include *Haemophilus influenzae* (47%), *Streptococcus pneumoniae* (26%), *Pseudomonas aeruginosa* (22%) and *Moraxella catarrhalis* (17%).[8,10,32] Sampling of sputum should be considered during exacerbation of airway disease, if appropriate, to guide antimicrobial therapy. More specifically, testing for acid-fast bacilli should be considered if there is clinical suspicion of tuberculosis.[33] However, there might be constraints in collecting and processing sputum samples in certain remote clinics. Hence, local guidelines and recommendations on sputum sampling need to be considered.

Clinical features and management of specific conditions

Chronic obstructive pulmonary disease

COPD is highly prevalent among Aboriginal and Torres Strait Islander Australians, with a reported prevalence of up to 49%.[4] Shortness of breath on exercise is the most common presenting symptom among patients with COPD.[8] Although tobacco smoking is one of the most important risk factors for the development of COPD, cannabis use and exposure to environmental smoke, such as bushfires, or passive smoking in the context of overcrowding might also contribute to exacerbation of airway disease.[8,34,35] Patients with COPD also tend towards overall lower body weight and body mass index,[20] which indicates a higher disease burden due to

Parameter	Pred	LLN	Pre Best Trial 4	%Pred	Post Best Trial 2	%Pred	%Chg
FVC [L]	5.39	4.40	2.99*	55	3.00*	56	0
FEV_1 [L]	4.16	3.32	1.58*	38	1.68*	40	6
FEV_1 /FVC	0.773	0.676	0.530*	69	0.559*	72	5



Parameter	Pred	LLN	Pre Best Trial 3	%Pred	Post Best Trial 3	%Pred	%Chg
FVC [L]	3.70	2.99	2.40*	65	2.43*	66	1
FEV_1 [L]	2.96	2.36	1.48*	50	1.50*	51	1
FEV_1 /FVC	0.808	0.710	0.616*	76	0.615*	76	0

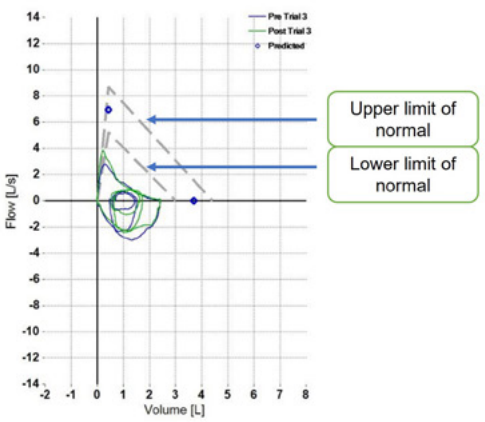


Figure 2. Examples of typical lung function patterns in Aboriginal and Torres Strait Islander patients with mixed restrictive and obstructive findings. %Chg, percent change post bronchodilator; FEV_1, forced expiratory volume in one second; Flow [L/S], litres per second; FVC, forced vital capacity; LLN, lower limit of normal; Pre, pre-bronchodilator; Post, post-bronchodilator; Pred, predicted.

higher resting energy expenditure and higher basal metabolic rate.[36] There are significant differences in the clinical manifestations of COPD between Aboriginal and Torres Strait Islander patients and non-Indigenous patients.[37] Concurrent bronchiectasis among patients with COPD is highly prevalent (up to 50%).[8,10] FEV_1 values on spirometry in patients with COPD are significantly reduced compared with predicted values (46% predicted)[20] and, in line with chest radiology, demonstrate advanced COPD disease burden, including the presence of bullous disease.[28] Exacerbation of airway disease, including COPD, is a common reason for hospital admission.[38]

Currently, evidence on pharmacotherapy interventions and guidelines for COPD management specific for Aboriginal and Torres Strait Islander patients is lacking. However, airway-directed inhaled pharmacotherapy, such as short-acting β_2 agonists, short-acting muscarinic antagonists, long-acting β_2 agonists, long-acting muscarinic antagonists and ICS, are widely used in the management of COPD.[24] Studies examining non-pharmacotherapy COPD management (eg pulmonary rehabilitation) have reported that these interventions are difficult to access, particularly for Aboriginal and Torres Strait Islander people living in remote communities.[39] Hypoxaemia and oxygen desaturation on exercise are not uncommon in Aboriginal and Torres Strait Islander patients with COPD; however, there are barriers in facilitating home oxygen therapy, often stemming from household crowding and exposure to smoke in remote communities.[40] Furthermore, patients living in remote communities could have difficulties accessing, maintaining and supplying constant power to oxygen equipment. Despite the challenges associated with home oxygen, previous studies have demonstrated benefits and outcomes in this population.[41] Therefore, home oxygen therapy should be considered and facilitated when appropriate and feasible. Social and education programs regarding smoking cessation (including cannabis) supported by general practitioners, Aboriginal health practitioners and/or nurses might not only improve the patient's symptom burden and help prevent lung disease, but also make a home environment where oxygen therapy is

Figure 3. Bushfire smoke during the dry season in the Northern Territory. Bushfire smoke in the vicinity of remote communities can have adverse effects on the health of those with chronic airway diseases.

more safe/feasible.[42] Moreover, improved education and communication regarding the disease itself will aid in improving patient's self-management and prevent hospitalisations.[9]

Bronchiectasis

Chronic respiratory tract infections play a pivotal role in the pathogenesis and pathophysiology among patients with bronchiectasis, thereby giving rise to a vicious cycle of recurrent infections and airway inflammation.[7] There is growing evidence in the literature to suggest that bronchiectasis is highly prevalent among adult Aboriginal and Torres Strait Islander Australians.[6,32,43–45] Furthermore, concurrent presence of other medical comorbidities, including COPD, cardiovascular and chronic kidney diseases, appears to be driving higher overall mortality.[6,32] Lung function parameters more often display a restrictive pattern among patients with bronchiectasis in isolation and demonstrate much more severe and mixed impairment when COPD co-exists.[10,20]

Although COPD and bronchiectasis share several similar clinical features, the management of these conditions differs; hence, in clinical practice, differentiating these conditions and recognising concurrent COPD and bronchiectasis, especially when inhaled directed airway pharmacotherapy is considered, is vital. It is generally recommended that ICS are used with caution in patients with bronchiectasis. Importantly, the use of ICS among Aboriginal and Torres Strait Islander adults with bronchiectasis could contribute to yearly decline in FEV_1.[46] The exact reason for excessive decline with ICS use is unknown, but it is possible that ICS perpetrates ongoing airway inflammation by facilitating higher bacterial burden. Hence, extreme caution has to be exercised when using ICS in this population with bronchiectasis until further research is available to demonstrate safety and efficacy.

Sputum clearance manoeuvres are recommended as one of the main treatment modalities for patients with bronchiectasis.[47] Airway clearance interventions are less frequently implemented among Aboriginal and Torres Strait Islander patients diagnosed with bronchiectasis,[32,39] and more needs to be done to address access barriers to chest physiotherapy programs for remote Aboriginal and Torres Strait Islander people.[48] These interventions might reduce recurrent presentations of exacerbations, the use of antibiotics and hospital admissions. Online resources such as the Bronchiectasis Toolbox can be of use for patient education and management.[49] In the future, exploring the feasibility and efficacy of telehealth models for specialist or allied health interventions might be particularly useful among populations residing in remote areas.

Asthma

The prevalence of asthma among Aboriginal and Torres Strait Islander Australians is generally reported to be between 7% and 26%.[4] The hallmark symptoms of asthma, including cough, wheezing, chest tightness and shortness of breath, are very similar to those of COPD and bronchiectasis, which are also highly prevalent in the Aboriginal and Torres Strait Islander population, alongside a high prevalence of smoking, and might mimic asthma.[4,7,32] Furthermore, environmental influences, such as exposure to bushfire smoke in the vicinity of remote communities can have an influence on chronic airway diseases (Figure 3).[35] Clinical features such as cough, wheeze, chest tightness, variable shortness of breath and the presence of bronchodilator response on spirometry are indicative of asthma.[12] However, a study from the Top End Health Service demonstrated that almost half of those with a bronchodilator response had radiological evidence of COPD and/or bronchiectasis, and thus this finding must be interpreted with caution.[12] Asthma diagnosis and management guidelines specific to Aboriginal and Torres Strait Islander people might be useful in the future, including the feasibility, safety and efficacy of biological drugs.

Respiratory and concomitant medical comorbidities

Concomitant medical comorbidities, such as cardiovascular disease, hypertension, diabetes and chronic kidney disease, are present in 13–46% of people with chronic respiratory disorders.[8,10,32,50] Obstructive sleep apnoea is also highly prevalent in Aboriginal and Torres Strait Islander adults.[51] The concurrent presence of comorbidities might give rise to higher overall morbidity and mortality. Hence, it is imperative that addressing and managing comorbidities should be considered in the holistic management of Aboriginal and Torres Strait Islander patients with respiratory disorders. The annual health check provides an ideal opportunity for early prevention and screening, as well as tracking the progress of any respiratory disorders.[15] Chronic disease management plans and team care arrangements are also critically important for optimising respiratory and overall health. For example, chronic disease plans are an opportunity to address immunisations for pneumococcal disease, influenza, COVID-19 and pertussis if required; the team care arrangement provides opportunities to refer to physiotherapy and other specialised services.

Conclusion

There is overwhelming evidence that Aboriginal and Torres Strait Islander Australians exhibit different clinical and physiological manifestations of chronic respiratory conditions. Due to a gap in guidelines specific for Aboriginal and Torres Strait Islander people, clinicians are reliant on general population guidelines. It is critical to understand the different demographic and clinical manifestations, including lung function parameters and the presence of respiratory comorbidities, to optimise management for Aboriginal and Torres Strait Islander people with chronic respiratory conditions. Furthermore, collaborative and constructive efforts between primary care services, remote community organisations and specialist services would aid in tackling the chronic health burden among Aboriginal and Torres Strait Islander adults.

Key points

- COPD in isolation or concurrent with bronchiectasis is highly prevalent.
- In the presence of multirespiratory morbidity, symptoms might mimic asthma.
- Restrictive impairment is the most common spirometry pattern.
- General population guidelines might not directly apply to Aboriginal and Torres Strait Islander populations.
- Consider caution in the use of ICS in patients with combined COPD and bronchiectasis.

Note/disclaimer

The content represented/recommendations in this paper are based on the authors' clinical/research experience in the treatment/management of Aboriginal and Torres Strait Islander people with respiratory disorders in the Top End region of the NT. Although the clinical discussion presented is likely relevant to other remote Aboriginal and Torres Strait Islander communities outside of this region, the authors acknowledge that not all aspects are generalisable to Aboriginal and Torres Strait Islander populations within the NT or across Australia. As such, other intrinsic or extrinsic factors need to be considered, including household overcrowding, indoor air pollution, recurrent respiratory infections and other social or geographic determinants that might have an influence on respiratory disorders. Hence, health workers are urged to take into account individual patients' clinical scenarios and sociodemographic characteristics in clinical decision making. Further, an individual's ethnicity might not have any influence on the presence or absence, or the severity, of lung diseases.

Authors

Subash S Heraganahally FRACP, Director, Department of Respiratory and Sleep Medicine, Royal Darwin Hospital, Darwin, NT; Professor, School of Medicine, Charles Darwin University, Darwin, NT; Associate Professor, College of Medicine and Public Health, Flinders University, Darwin, NT; Respiratory Physician, Darwin Respiratory and Sleep Health, Darwin Private Hospital, Darwin, NT

Timothy Howarth PhD, Postdoctoral Researcher, Darwin Respiratory and Sleep Health, Darwin Private Hospital, Darwin, NT; Postdoctoral Researcher, Department of Technical Physics, University of Eastern Finland, Kuopio, Finland

Winnie Chen FRACGP, General Practitioner, Danila Dilba Health Services, Darwin, NT; Lecturer, NT Medical Program, Flinders University, Darwin, NT; Senior Research Fellow, Menzies School of Health Research, Darwin, NT

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Correspondence to:
winnie.chen@menzies.edu.au

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Head and neck cancer surveillance: A guide past the five-year mark

Jennifer Chen, Neil Foden, David Hogan, Sarju Vasani

Background
A head and neck cancer patient has completed treatment and five-year surveillance with their oncologists and surgeons and has been discharged back into your care. What is next and what do you not want to miss in this patient?

Objective
This article aims to provide the general practitioner with a practical guide and an up-to-date evidence-based review on how to manage the head and neck cancer survivor.

Discussion
Attentive surveillance encompassing risk stratification and guidance, early detection of recurrence and second malignancies, effective management of chronic symptoms and the provision of psychosocial support are fundamental in providing a holistic and comprehensive care plan for the head and neck cancer survivor.

HEAD AND NECK squamous cell cancer (HNSCC) is the sixth most common cancer worldwide, with 890,000 new cases in 2018.[1] The incidence of HNSCC is expected to increase by 30% to 1.08 million new cases annually by 2030.[1] Within Australia, head and neck cancer is the seventh most common cancer diagnosed.[2] As the incidence of head and neck squamous cell cancer continues to rise, along with advances in head and neck cancer treatments, general practitioners (GPs) will be faced with an influx of head and neck cancer survivors and play a pivotal role in their long-term care. Figure 1 provides a general overview of the classification and subtypes of HNSCC.

Current clinical practice defines the Australian head and neck oncology framework as a five-year follow-up period by surgical and oncological specialists following treatment. If there is no recurrence of malignancy or other acute clinical concern during this time, the patient is subsequently discharged into the care of their GP.[3]

Reaching the five-year mark is indeed a significant milestone. However, the ongoing care of head and neck cancer survivors can be complex and challenging. This involves managing chronic symptoms, many of which tend to worsen over time, as well as addressing the persistent risk of second primary malignancies, which accumulates over the patient's lifetime.[4–6]

Aim

This article aims to provide a practical evidence-based guide and comprehensive overview for GPs to follow for the surveillance and management of the head and neck cancer survivor.

What are the aims of a head and neck cancer consultation?

The main aims of a head and neck cancer consultation are:

- risk stratification and counselling (eg smoking and alcohol cessation)
- to detect and/or exclude recurrence
- to detect and/or exclude second primary malignancy
- management of chronic symptoms
- psychosocial support
- management of comorbidities.

Following a patient's discharge from tertiary care, we recommend an annual clinic appointment dedicated to their head and neck cancer surveillance with GP specialists to follow up on any functional sequelae from treatment and to exclude recurrent or second malignancies. Box 1 illustrates the 'red flag' signs and symptoms that might indicate recurrent malignancy.

Emphasis on the multidisciplinary model will ensure holistic care of the HNSCC patient, as outlined in recent survivorship guidelines.[7] Examples of this include referral

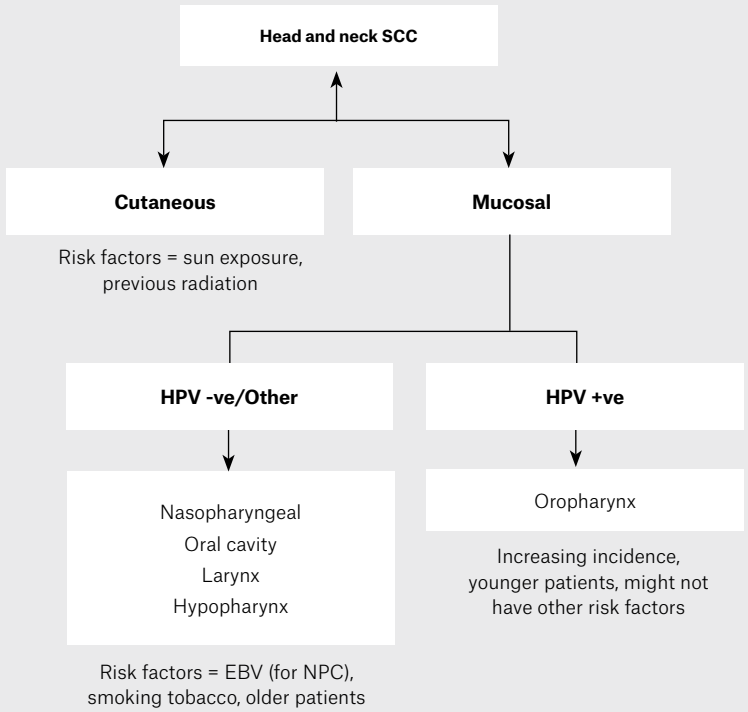

Figure 1. Head and neck cancer overview.
–ve, negative; +ve, positive; EBV, Epstein–Barr virus; HPV, human papillomavirus; NPC, nasopharyngeal carcinoma; SCC, squamous cell carcinoma.

to community speech pathology for the management of dysphagia, referral to psychology for psychological support and referral to physiotherapy for lymphoedema massage, all useful approaches to ensure a holistic approach for management of the head and neck cancer patient. Refer to Box 2 for a summary on HNSCC surveillance management within a consultation.

Risk stratification and counselling

Risk stratifying and effective counselling have vital roles within head and neck cancer surveillance. Smoking and alcohol are the leading risk factors for head and neck cancer (in particular those not caused by human papillomavirus [HPV]), and patients who continue to partake are at exceptionally high risk of developing recurrence or a second primary malignancy.[8] Cessation of tobacco smoking and alcohol consumption is of vital importance and has been shown to reduce head and neck cancer patients' risk of further cancer.[9]

In recent years, the evolving paradigm surrounding HPV-related disease has caused a seismic shift in the risk stratification and clinical management of a specific subset of head and neck cancer patients. HPV now has a well-established role in the development of HNSCC, in particular oropharyngeal cancers, with distinct molecular, clinical and epidemiological characteristics compared with HPV-negative cancer patients.[10] The rising incidence of oropharyngeal SCC, paradoxically occurring alongside declining smoking rates, can be fundamentally attributed to this 'epidemic' of HPV infection.[11]

Because HPV-positive HNSCC patients are typically younger without the traditional risk factors of smoking and alcohol, awareness and counselling for this cohort are especially important. HPV-related counselling that includes the prevalence and transmission of HPV infection (including risk to current or future partners after treatment and the role of vaccination) is recommended best practice in the European Head and Neck Cancer Society guidelines.[12]

HPV vaccination (Gardasil 9) has been approved since 2020 by the US Food and Drug Administration for the prevention of oropharyngeal HPV-related cancers (including HPV subtypes 16, 18, 31, 33, 45, 52 and 58).[13] Within Australia, the national vaccination program recommends a single dose of HPV vaccine for all younger people from age nine years.[14]

It should be noted that HPV vaccination can have a prophylactic role in preventing new HPV disease but does not treat pre-existing infection.

Ultimately, raising awareness, HPV-related counselling and vaccine advocacy will allow for the empowerment and holistic care of HPV-related HNSCC survivors.

What are the chronic symptoms to expect and how do we manage these?

Most head and neck cancer survivors will have long-term upper aerodigestive tract symptomatology secondary to their cancer treatment (surgery and/or radiation).

Common symptomatology includes chronic dysphagia, xerostomia, neck lymphoedema, conditions related to reduced mucociliary clearance after radiation (middle ear effusion, rhinitis or chronic rhinosinusitis) and depression/anxiety.

Chronic dysphagia

Indications to investigate further include worsening dysphagia, modification of diet and weight loss. Barium (contrast) swallow can be helpful in assessing the passage of contrast from the oral cavity to the stomach. A barium swallow can help differentiate between general dysmotility (ie secondary to presbyoesophagus) from obstructive causes that might be reversible, such as cricopharyngeal spasm or bar, oesophageal stenosis/stricture or pharyngeal pouches. Ensure patients are linked in with community speech pathologists. Upper gastrointestinal endoscopy might also be indicated to exclude

Box 1. Clinical red flags and when to investigate further

- NEW onset or worsening upper aerodigestive tract symptomatology
  - Odynophagia
  - Dysphagia
  - Dysphonia
- Lateralising symptoms (ie unilateral sore throat, unilateral odynophagia)
- Otalgia with no clear cause
- Neck lump
- Haemoptysis
- Unexplained weight loss
- New cough, shortness of breath or noisy breathing
- Patient concern

Box 2. Summary of head and neck squamous cell cancer management in primary care

- Annual consultation dedicated to the patient's head and neck squamous cell cancer surveillance
  - History
  - Examination: Palpation of the neck and examination of the oral cavity/oropharynx and any other relevant sites
- Multidisciplinary approach, including review by speech pathologists, dietitians, psychology and lymphoedema physiotherapy
- If the patient had a cutaneous head and neck cancer, then 6- to 12-monthly full-body skin checks by a skin specialist general practitioner or dermatologist is indicated
- Annual low-dose computed tomography of the chest for high-risk patients
  - Persistent smokers and moderate–severe emphysema
  - Recent ex-smokers with a long pack-year history (National Lung Screening Trial criteria)[33]

malignancy or to treat the condition (eg dilatation of radiotherapy-induced stenosis).

Xerostomia

A dry, sore mouth and throat is a common side effect in patients who have received primary radiation to their head and neck cancer. This might also be associated with the presence of dental caries or decay because prolonged hyposalivation can lead to disruption of the oral microflora.[15–18] Therefore, encouraging good oral hygiene, as well modifying the diet to avoid dry, spicy or astringent foods, might help improve a patient's symptoms. Artificial saliva products are also effective at alleviating symptoms.[19] Using cholinergic agonists when residual secretory capacity is still present might also be beneficial.[20]

Neck lymphoedema

It is common for patients to have chronic neck lymphoedema if they have had treatment to their cervical lymph nodes through either radiotherapy and/or neck dissections. Chronically over time, this will feel fibrotic and is commonly described as 'woody'. In severe cases, this can give rise to neck stiffness and a reduction in neck mobility. Physiotherapy with lymphoedema massage is useful in alleviating symptoms.

Depression/anxiety

Head and neck cancer is a debilitating physical and mental health disease with a significant impact on quality of life and subsequently on psychosocial outcomes. Head and neck cancer patients experience more psychosocial distress and have higher levels of depression and anxiety than other cancer populations.[21–23] Head and neck cancer patients are found to have an increased risk of depression with suicidal ideation.[24] Patients are linked in with cancer care psychosocial support services from the day of diagnosis; however, due to patient or systemic circumstances, many are lost to care. Therefore, continuity of psychosocial care within the community with foundational support from their GP specialist is paramount for the mental health and wellbeing of these survivors.

Ultimately, offering psychosocial support and early referral to services, including psychology and/or psychiatry for consideration of cognitive behavioural therapy and antidepressants, are important considerations within the head and neck cancer surveillance appointment.

Other (cardiovascular and respiratory health)

Cardiovascular disease is the leading cause of non-cancer morbidity and mortality among HNSCC survivors, with the average HNSCC patient having a three-fold greater likelihood of developing cardiovascular disease compared to their counterpart in the general population.[25] This is largely attributed to their increased use of tobacco smoking and alcohol, which are known risk factors for the development of their primary cancer. HNSCC survivors also face an increased risk of death from any cause.[26] Due to a prolonged smoking history, many have emphysema, cardiovascular disease, cerebrovascular disease, hypothyroidism (particularly in the setting of patients after radiation therapy) and chronic kidney disease (secondary to nephrotoxicity from chemotherapeutic agents). Monitoring for these comorbidities, preventative care and counselling for lifestyle modifications can improve the morbidity and mortality rates for this high-risk cohort.

Visual atlas for clinical lesions of concern

Figures 2 and 3 are images of commonly seen pre-neoplastic lesions within the oral cavity.

Which investigations?

An ultrasound of the neck is a practical starting point for any concerns in the neck: it is relatively cost-effective and does not expose the patient to radiation. If any

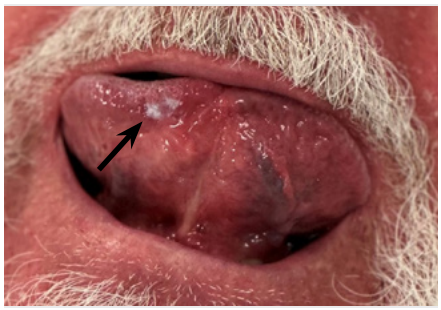

Figure 2. Leukoplakia right ventral tongue (biopsy: mild dysplasia).

Leukoplakia is a clinical diagnosis and presents as a white patch (arrow) within the head and neck squamous cell cancer mucosa. Unlike fungal infections, leukoplakia usually cannot be wiped off. Management options include a short period of observation or biopsy.

suspicious nodes are identified, they can be followed up with a fine needle aspiration or core biopsy. These investigations should ideally be directed towards palpable lesions.

Barium swallow is a useful diagnostic tool for initial assessment of dysphagia and can exclude pouches, obstructive masses, strictures/stenosis and dysmotility issues.

Computed tomography with contrast is a useful investigation when cross-sectional imaging is required to investigate any concerning upper aerodigestive tract symptoms.

Magnetic resonance imaging can be considered, particularly for patients with cancers of the tongue or tongue base (suprahyoid pathology) or if there are any concerns for perineural spread. Magnetic resonance imaging provides excellent soft tissue definition.

Screening for a second primary malignancy

A second primary malignancy contributes to a 23% mortality rate in head and neck cancer survivors.[26] The lung is the most common location for developing a second primary malignancy in HNSCC survivors.[5] Following diagnosis of a second lung malignancy, survival is exceptionally poor.[28–30]

Updated guidelines from the National Comprehensive Cancer Network recommend that patients with head and neck cancer with a 20 pack-year or more smoking history undertake annual screening with low-dose computed tomography (LDCT).[31]

The National Lung Cancer Screening Trial demonstrated a 20% reduction in lung cancer-specific mortality by screening high-risk individuals using LDCT compared with radiography.[32]

There are currently no blood tests indicated for surveillance of head and neck cancer. However, in the future, liquid biopsy might play an increasing role in this area.

When to refer back to the oncologist or surgeon?

A referral back to the oncologist or surgeon should be made in the case of:

- patient concern – generally, HNSCC patients who have attended their surveillance appointments at hospital for five years are in tune with their own health/symptoms. If the patient is ever concerned about a new finding or symptom, this alone might be enough to warrant a referral back to the specialist
- clinical (red flags) or radiological suspicion.

Referrals with clinical concern will be categorised as an urgent appointment to be seen within 30 days. If there is histopathological evidence of recurrent malignancy, please consider telephoning the specialist on call directly to flag the referral so the patient's appointment can be expedited.

Conclusion

In conclusion, the management and surveillance of head and neck cancer survivors represent a critical aspect of these patients' ongoing care. As the incidence of HNSCC continues to rise globally, it is essential for healthcare providers, especially GPs, to be well equipped to face the challenges and responsibilities associated with surveillance past the five-year mark. Through a structured annual surveillance appointment, the key elements to the long-term care for the head and neck cancer survivor include risk stratification, counselling for lifestyle changes, detecting recurrence/second primary malignancies, managing chronic symptoms and providing essential psychosocial support. A multidisciplinary approach, close attention to red flag symptoms and collaboration with specialists when necessary are crucial to providing holistic and comprehensive care for the head and neck cancer survivor.

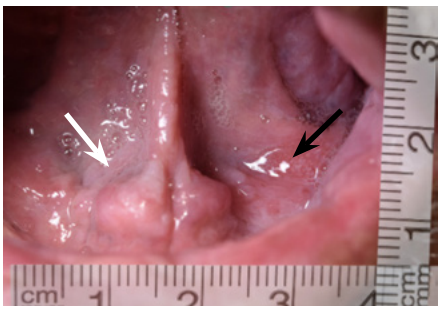

Figure 3. Erythroplakia on left floor of mouth (white arrow, biopsy: invasive T1 squamous cell carcinoma). Note the erythematous lesion which had an underlying firm lesion to palpation. Leukoplakia on right floor of mouth (black arrow, biopsy: low grade dysplasia). Note the white plaque-like lesions on the right floor of the mouth.

Erythroplakia presents as a red patch in the mucosa and has a 44.9% rate of developing into invasive carcinoma.[27] Features that might alert the clinician that this is a 'suspicious' lesion include the deeper erythematous patch, which is often well demarcated. It may or may not be surrounded with a white patch (erythroleukoplakia vs erythroplakia). Visual inspection should always be coupled with a physical examination (by palpation of the lesion), where it might feel irregular (particularly if an invasive cancer is present); however, it can also be soft to palpation at times. Management options include referral to a specialist for biopsy.

Key points

- Contact the ear nose and throat specialist or registrar on call, or submit an urgent referral, if ever there is any concern.
- Take patient concern seriously.
- Look out for red flag symptoms (new onset odynophagia, dysphagia, haemoptysis, dysphonia, lateralising symptoms, otalgia without a clear case, neck lump).
- Cross-sectional imaging is useful as an initial investigation, keeping in mind a negative computed tomography scan does not exclude malignancy (small mucosal cancers can be radiologically occult).
- For patients with a primary or presumed cutaneous skin cancer, 6- to 12-monthly whole-body skin checks are critical.

Authors

Jennifer Chen MD, Unaccredited Otolaryngology Registrar, Department of Otolaryngology Head and Neck Surgery, Sunshine Coast University Hospital, Sunshine Coast, Qld

Neil Foden MBChB (Hons), Consultant Head and Neck Surgeon, Department of Otolaryngology Head and Neck Surgery, Sunshine Coast University Hospital, Sunshine Coast, Qld

David Hogan BSc, MBBS, FRACS (OHNS), PGDip HPE, Consultant Head and Neck Surgeon, Department of Otolaryngology Head and Neck Surgery, Sunshine Coast University Hospital, Sunshine Coast, Qld

Sarju Vasani MA (Cantab), MB, BChir Medicine (University of Cambridge), FRACS (OHNS), PGDip (Healthcare Leadership), FRCS, Consultant Head and Neck Surgeon, Department of Otolaryngology Head and Neck Surgery, Royal Brisbane and Women's Hospital, Brisbane, Qld; Griffith Institute for Drug Discovery, Griffith University, Brisbane, Qld

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Correspondence to:
jennifer.chen@health.qld.gov.au

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Sodium–glucose cotransporter 2 inhibitors for chronic kidney disease: Why, when and when not

Muhammad M Javaid, Rachel Frederick, Sheema Itrat, Adel Ekladious

Background
Chronic kidney disease (CKD) is a significant healthcare problem. More advanced stages are associated with increased mortality, morbidity and cost. Instigating measures to slow down disease progression at an early stage can save lives, and millions of dollars of taxpayers' money.

Objective
This article aims to provide evidence-based information to general practitioners, aiding the decision to initiate sodium–glucose cotransporter 2 (SGLT2) inhibitors for CKD patients in their day-to-day practice.

Discussion
SGLT2 inhibitors have emerged as a promising and safe addition to the renin–angiotensin–aldosterone system blockers for managing CKD. Randomised controlled trials have shown that SGLT2 inhibitors effectively slow CKD progression in both early and more advanced disease stages, regardless of diabetes status. SGLT2 inhibitors can be a valuable additional treatment option for CKD management in primary care and should be considered for most CKD patients.

CHRONIC KIDNEY DISEASE (CKD) is a common healthcare problem affecting 1 in 10 adult Australians.[1] At the beginning of the 2020s, an estimated 2.5% of working-age Australians were living with more advanced CKD Stage 3–5.[1] Over 15,000 people were on dialysis, and more than 13,000 were living with kidney transplants.[2] Diabetes was the leading cause of end-stage kidney disease (ESKD), accounting for 40% of cases.[2]

CKD is an independent risk factor for cardiovascular and all-cause mortality. The adjusted mortality risk increases significantly with disease progression and, compared with the general population, doubles in patients with CKD Stage 3 and is three-fold greater in those with CKD Stage 5.[3] CKD costs the Australian government nearly $5 billion annually, with over $1 billion alone needed for ESKD requiring renal replacement therapy.[1]

It is estimated that the incidence of CKD in Australia will increase, with the number of new patients with CKD Stage 3–5 predicted to exceed 160,000 by 2030, with a two-fold increase in the number needing renal replacement therapy.[1]

Preventing only 10% of CKD cases from advancing to these late stages could result in almost 550 years of life and over $1.5 billion saved, emphasising the need for early diagnosis and instigating measures to prevent disease progression.[1]

Renin–angiotensin–aldosterone system (RAAS) blockade has been the mainstay of managing CKD for the past few decades. However, there has been an unmet need for additional treatment options for additive effects to RAAS blockers. In recent years, sodium–glucose cotransporter 2 (SGLT2) inhibitors have emerged as promising agents, with growing evidence for cardiorenal protection. If used appropriately, SGLT2 inhibitors can significantly improve the outcome for CKD patients.

Aim

This article aims to provide evidence-based information to general practitioners, aiding the decision to initiate SGLT2 inhibitors for CKD in their day-to-day practice.

What are SGLT2 inhibitors and how do they protect the kidneys?

SGLT2 receptors are proteins in the proximal tubules responsible for reabsorbing almost 90% of filtered glucose coupled with sodium. The primary effect of SGLT2 inhibitors is to block sodium and glucose reabsorption, leading to glucosuria, natriuresis and osmotic diuresis.[4] Increased sodium delivery to the macula densa in the distal tubules stimulates vasomotor changes that reduce the intraglomerular pressure.

This effect preserves renal function and reduces proteinuria in the long term.[5] A modest but sustained reduction in blood pressure, weight loss, decreased inflammation and improved cell survival are the additional factors contributing to the renoprotective effects of SGLT2 inhibitors. Furthermore, increased distal sodium delivery promotes urinary potassium excretion, which might facilitate uptitration of RAAS blockage to a more effective dose with less risk of hyperkalaemia.[5,6]

What is the evidence for the benefits of SGLT2 inhibitors in CKD?

The renoprotective effects of SGLT2 inhibitors were initially reported in cardiovascular outcome trials involving patients with type 2 diabetes (T2D) as secondary outcomes.[7–9] Subsequent randomised controlled trials looking at primary renal outcomes provided more convincing evidence of the effectiveness of SGLT2 inhibitors in slowing CKD progression across a broader patient population (Table 1). The results showed that canagliflozin, dapagliflozin and empagliflozin significantly reduced the progression of CKD.[10–12] Although canagliflozin was only used for patients with T2D with diabetic kidney disease, dapagliflozin and empagliflozin were shown to be effective regardless of diabetes status, renal diagnosis, CKD stage, estimated glomerular filtration rate (eGFR) at enrolment, race, gender and the presence of proteinuria. However, the proportional risk reduction was more pronounced in patients with a higher urine albumin:creatinine ratio, a group with a higher risk of disease progression.[10–12]

Is any SGLT2 inhibitor superior to others?

At the time of this review, no head-to-head trials had compared different SGLT2 inhibitors. Evidence from renal outcome studies shows that empagliflozin, dapagliflozin and canagliflozin are all effective in preserving renal function with comparable results and are presumed to have a class effect (Table 1). Considering this, one can extrapolate that physicians can choose the SGLT2 inhibitor that is most suitable for their CKD patients (Figure 1). A prespecified

Table 1. Summary of renal outcome with sodium–glucose cotransporter 2 inhibitors randomised controlled trials

Study	Summary	Interventions	Renal-specific outcomes
CREDENCE 2019[10]	Age ≥30 years with T2D and DKD eGFR 30–89 mL/min/1.73m^2 uACR 33.9–565 mg/mmol Stable dose level of RAAS blocker Patients with non-DKD, T1D, history of renal transplant, dialysis or immunosuppression excluded	Canagliflozin 100 mg daily vs placebo	Median follow-up 2.62 years Canagliflozin caused a 34% reduction in the relative risk of the renal-specific composite of ESKD, a doubling of the creatinine level or death from renal causes Canagliflozin caused a 32% reduction in the relative risk of ESKD Mean uACR was 31% lower in the canagliflozin group
DAPA-CKD 2020[11]	Patients with diabetes (67.5%) and without diabetes (32.5%) eGFR 25–75 mL/min/1.73m^2 uACR 22.6–565 mg/mmol Stable dose level of RAAS blocker[A] Patients with T1D, APKD, ANCA vasculitis, lupus nephritis, history of immunosuppression within 6 months excluded	Dapagliflozin 10 mg daily vs placebo	Median follow-up 2.40 years Dapagliflozin was associated with a 39% reduction in the primary outcomes of a sustained decline in eGFR by >50%, ESKD and renal or cardiovascular death Mean urine ACR was 29.3% lower in the dapagliflozin group
EMPA-KIDNEY 2022[12]	eGFR 20–44 mL/min/1.73 m^2, regardless of albuminuria eGFR 45–89 mL/min/1.73 m^2 with uACR ≥22.6 mg/mmol Patients with diabetes (46.2%) and without diabetes (53.8%) Stable dose level of RAAS blocker[A] Patients with APKD and renal transplant were excluded	Empagliflozin 10 mg once daily vs placebo	Median follow-up 2 years Compared with placebo, empagliflozin reduced the risk of progressive kidney disease (ESKD, a sustained decrease in eGFR to <10 mL/min/1.73 m^2 or a sustained reduction in eGFR of ≥40% from baseline, or death from renal causes) or death from cardiovascular causes by 28%

[A]Patients unable to receive renin–angiotensin–aldosterone system (RAAS) blockers due to any reason were eligible for inclusion in the study.

ACR, albumin:creatinine ratio; ANCA, antineutrophil cytoplasmic antibody; APKD, adult polycystic kidney disease; DAPA-CKD, Dapagliflozin on Renal Outcomes and Cardiovascular Mortality in Patients with CKD trial; DKD, diabetic kidney disease; eGFR, estimated glomerular filtration rate; EMPA-KIDNEY, Empagliflozin in Patients with Chronic Kidney Disease trial; ESKD, end-stage kidney disease; T1D, type 1 diabetes; T2D, type 2 diabetes; uACR, urine albumin:creatinine ratio.

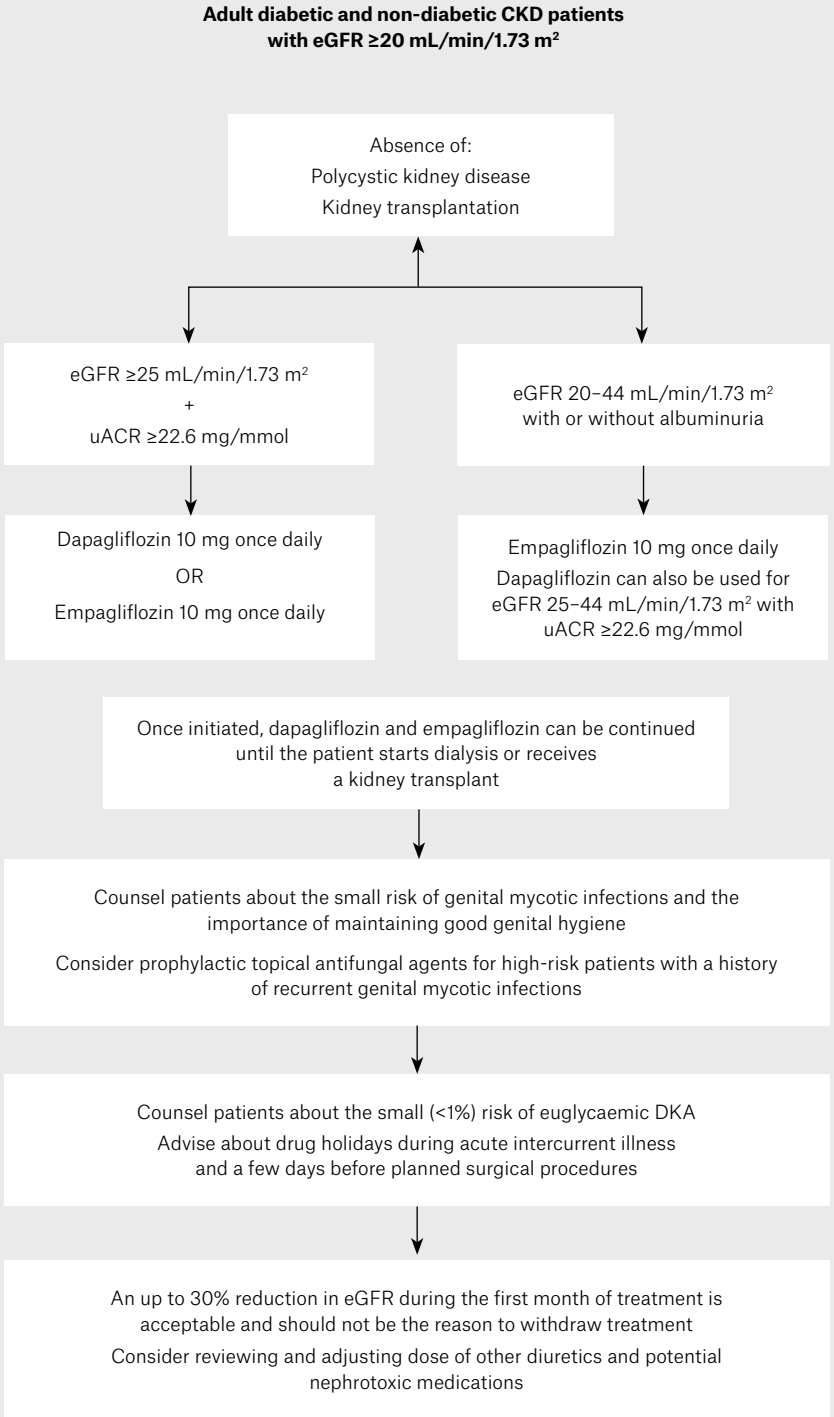

Figure 1. Flow chart for the use of sodium–glucose cotransporter 2 (SGLT2) inhibitors in patients with chronic kidney disease (CKD).

DKA, diabetic ketoacidosis; eGFR, estimated glomerular filtration rate; uACR, urine albumin:creatinine ratio.

analysis of the Dapagliflozin on Renal Outcomes and Cardiovascular Mortality in Patients with CKD (DAPA-CKD) trial showed that dapagliflozin caused a more significant reduction in CKD progression in T2D patients with a higher HbA1c level and a higher urine albumin:creatinine ratio, and might be a preferred agent in this group of patients.[13] Of the three SGLT2 inhibitors (canagliflozin, empagliflozin, and dapagliflozin) used in major trials, Canagliflozin and Renal Events in Diabetes with Established Nephropathy Clinical Evaluation (CREDENCE), Empagliflozin in Patients with Chronic Kidney Disease (EMPA-KIDNEY), and DAPA-CKD (Table 1), only dapagliflozin and empagliflozin are commercially available in Australia for clinical use. Dapagliflozin and empagliflozin are both subsidised under the Pharmaceutical Benefits Scheme for CKD using DAPA-CKD criteria (Table 1). Patients with polycystic kidney disease, lupus nephritis, antineutrophil cytoplasmic antibody–associated vasculitis, patients with an organ transplant and patients on immunosuppressive therapy for kidney diseases are not eligible.

What is the risk of serious adverse effects of SGLT2 inhibitors?

The safety of SGLT2 inhibitors was established in large randomised controlled trials and meta-analyses (Table 2).[10–15] Apart from the known increased risk of mycotic genital infections, there was no evidence of an increased risk of serious urinary tract infections, Fournier's gangrene, lower limb amputations and fractures.[10–15] Studies have not shown an increased risk of severe volume depletion and dehydration.[11,12] A meta-analysis showed that SGLT2 inhibitors reduced the risk of acute kidney injury by 23% in patients with and without diabetes.[15]

A previous history of mycotic genital infections is not a contraindication for SGLT2 inhibitors. However, patients should be counselled about this possible side effect and advised to maintain good genital hygiene to minimise the risk. Topical prophylactic antifungal agents can be considered in high-risk individuals. Uncomplicated mycotic genital infections can be treated with oral antifungal agents, and discontinuation of SGLT2 inhibitors is usually not needed.[16]

Is there a right or wrong patient to initiate SGLT2 inhibitors for CKD?

SGLT2 inhibitors are effective in slowing CKD progression across a wide range of eGFR (20–89 mL/min/1.73 m^2) and renal diagnoses and can be used in most CKD patients.[10–12] However, all major trials to date have excluded patients with adult polycystic kidney disease or a kidney transplant, and existing evidence does not support the use of SGLT2 inhibitors in these patient groups.[10–12] Similarly, no evidence supports the initiation of SGLT2 inhibitors in patients with eGFR below 20 mL/min/1.73m^2. However, if already on an SGLT2 inhibitor, patients can continue treatment until they reach ESKD or are transplanted.[10–12]

Although 2.2% of patients in the EMPA-KIDNEY trial had type 1 diabetes (T1D), other trials excluded patients with T1D, and there are limited data on the use of SGLT2 inhibitors in T1D to make a firm recommendation.[12,14]

SGLT2 inhibitors are equally effective in slowing CKD progression regardless of the eGFR at the initiation of treatment; however, considering the high morbidity and mortality associated with more advanced stages of CKD, initiating SGLT2 inhibitors at an early stage would be more beneficial.

Risk of euglycaemic diabetic ketoacidosis with SGLT2 inhibitors

There have been concerns about euglycaemic diabetic ketoacidosis (DKA) with SGLT2 inhibitors. However, the risk remains minimal (<1%), primarily limited to patients with diabetes.[10–12,17] Intercurrent illness, surgical stress, trauma, alcohol misuse, female gender, lean body mass, longstanding T2D and a more than 20% reduction in insulin dose are possible risk factors for DKA.[18] Despite the relatively low risk, patients should be counselled about the possibility of DKA at the initiation of SGLT2 inhibitors and educated about discontinuing the medication during intercurrent illness and two to three days before surgery. Special care should be taken in patients with T1D, and insulin doses should not be reduced by more than 20%.

Is an initial acute drop in eGFR with SGLT2 inhibitors problematic?

Like RAAS blockers, SGLT2 inhibitors cause an acute 10–30% drop in eGFR in the initial two to four weeks of therapy, followed by a sustained, slower, long-term reduction in CKD progression.[10–12] Rather than acute kidney injury, this drop represents the fall in intraglomerular pressure, a marker of the effectiveness of therapy and the basis of the long-term renoprotective effect of SGLT2 inhibitors. Studies have shown that patients with a >10% early eGFR decline with SGLT2 inhibitors had better long-term renal outcomes than those with a <10% initial eGFR decline.[19,20] Therefore, while remaining vigilant, physicians should anticipate this possibility following starting patients on SGLT2 inhibitors; an up to 30% reduction in eGFR in the initial month of therapy is acceptable and should not be the reason to discontinue treatment.[21]

Table 2. Risk of possible complications with sodium–glucose cotransporter 2 inhibitors[10–15]

Complication	Evidence of increased risk
Mycotic genital infections	Yes
Euglycaemic diabetic ketoacidosis	Yes (<1%)
Serious urinary tract infections	No
Fournier's gangrene	No
Lower limb amputations	No
Fractures	No
Volume depletion	No
Acute kidney injury	No

Conclusion

SGLT2 inhibitors are new treatment options for slowing CKD progression with good safety data. Treatment is effective in patients with or without diabetes, regardless of the presence of significant proteinuria. However, the benefit might be more pronounced in patients with heavier proteinuria. Along with RAAS inhibitors, SGLT2 inhibitors can potentially transform the landscape of CKD management and should be considered in most CKD patients down to an eGFR of 20 mL/min/1.73 m^2.

Key points

- SGLT2 inhibitors significantly slow CKD progression regardless of diabetes status and eGFR at initiation.
- Dapagliflozin can be initiated in patients down to an eGFR of 25 mL/min/1.73 m^2 and empagliflozin down to an eGFR of 20 mL/min/1.73 m^2.
- An up to 30% acute dip in eGFR is expected in the first month of treatment and should not be the reason to stop treatment.
- Patients should be counselled about the small but possible risks of mycotic genital infections and the importance of genital hygiene.
- Beware of the small risk of euglycemic DKA and counsel patients about drug holidays during intercurrent acute illness.

Authors

Muhammad M Javaid FRCP, FASN, FRACP, Adjunct Clinical Associate Professor, Rural Health Mildura, Monash University, Melbourne, Vic; Affiliate Associate Professor, School of Medicine, Deakin University, Warrnambool, Vic; Staff Specialist Nephrologist and Physician, South West Healthcare, Warrnambool, Vic

Rachel Frederick MBBS, Advanced Trainee General Medicine, University Hospital Geelong, Geelong, Vic

Sheema Itrat MRCGP, FRACGP, General Practitioner, Your Hobart Doctor, Hobart, Tas

Adel Ekladious FRCP, FRACP, Consultant Physician, Department of General Medicine and Acute Assessment Unit, Canberra Hospital, Canberra, ACT; Clinical Associate Professor, Faculty of Health and Medical Sciences, University of Western Australia, Perth, WA; Associate Professor, ANU College of Health and Medicine, Australian National University, Canberra, ACT

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Correspondence to:
mmjavaid@doctors.org.uk

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Risk treatment thresholds for initiating cardiovascular disease pharmacotherapy: Synthesis of international evidence to support guideline recommendations

Mai TH Nguyen, Sinan Brown, Emily Banks, Mark Woodward, Yuehan Zhang, Natalie Raffoul, Garry Jennings, Anushka Patel, Ellie Paige

Background
A new Australian guideline for cardiovascular disease (CVD) risk assessment and management was published in 2023, including new risk treatment thresholds.

Objective
This article summarises the published peer-reviewed global evidence that informed guideline recommendations on risk treatment thresholds for initiating blood pressure- and lipid-lowering therapy for CVD primary prevention.

Discussion
Evidence from 13 meta-analyses, randomised controlled trials and modelling studies involving more than 515,700 patients showed that preventive pharmacotherapy reduced the number of CVD events at all risk levels. Findings informed the new risk treatment thresholds outlined in the 2023 Australian CVD risk assessment and management guideline, which recommends blood pressure- and lipid-lowering pharmacotherapy for people at high five-year risk (≥10% based on the new risk calculator) and consideration of therapy for those at intermediate risk (5% to <10%) and generally does not recommend preventive pharmacotherapy for those at low risk (<5%).

CARDIOVASCULAR DISEASES (CVDs) are a leading cause of death and morbidity globally.[1] An estimated 80% of CVDs are preventable through interventions that reduce risk, such as avoiding tobacco use, maintaining a healthy diet, engaging in regular physical activity, and taking prescribed blood pressure- and/or lipid-lowering medications.[2,3] In people without known atherosclerotic CVD, stratifying and treating according to their estimated risk of developing CVD underpins primary prevention in Australia and internationally. In July 2023, an updated Australian guideline on CVD risk assessment and management was published, including a new risk calculator and recommended thresholds for initiating blood pressure- and lipid-lowering therapy.[4]

Aim

This article summarises an evidence synthesis undertaken to inform recommendations on the risk level to commence pharmacotherapy under the new guideline on CVD risk assessment and management.[4] The review was commissioned by the National Heart Foundation of Australia on behalf of the Australian Chronic Disease Prevention Alliance. It involved reviewing CVD risk treatment thresholds recommended in major international prevention guidelines and the latest peer-reviewed literature. Evidence on the effects of initiating blood pressure- and lipid-lowering therapy at different levels of CVD risk on fatal and non-fatal CVD events was considered.

CVD risk treatment thresholds recommended in major international guidelines

Risk treatment thresholds recommended for initiating preventive pharmacotherapy vary internationally. Most guidelines recommend a five-year equivalent primary CVD risk range of >5–10% for considering pharmacotherapy use, although specific risk categories vary between countries (Table 1). Several guidelines vary recommendations across a gradient of risk. For example, in New Zealand, blood pressure- and lipid-lowering therapy is strongly recommended for those with a five-year risk ≥15%, with potential treatment for those with 5–15% risk following patient–doctor discussions. In both the USA and Canada, preventive medications are recommended for those at high risk (≥20% 10-year risk) of CVD and lower risk (≥7.5% in the USA and <20% in Canada) if risk-enhancing factors are present (Table 1).

Evidence synthesis methods

We undertook an evidence synthesis focusing on evidence published since the 2012 Australian guideline was released.[15] We used systematic review methods (PROSPERO: CRD42021260012),[16] searching

Table 1. Overview of CVD risk treatment thresholds for initiating pharmacotherapy as recommended in major international guidelines

Country/region	Guideline	Risk treatment threshold
Canada	2021 Canadian Cardiovascular Society guidelines for the management of dyslipidaemia for the prevention of CVD in adults[5]	Lipid-lowering therapy recommended at ≥20% 10-year risk. Considered for those at low (<10%) or intermediate (10.0–19.9%) risk if additional criteria are met
New Zealand	2018 CVD risk assessment and management for primary care[6]	Lipid- and blood pressure-lowering treatment strongly recommended for ≥15% 5-year risk Considered (benefits and harms discussed) for 5–15% risk
England and Wales	CVD: Risk assessment and reduction, including lipid modification (updated 2016)[7,8]	Lipid-lowering treatment (atorvastatin) offered at ≥10% 10-year risk
Scotland	Risk estimation and the prevention of CVD (2017)[9]	Lipid-lowering treatment (atorvastatin) recommended at ≥20% 10-year risk
Europe	2021 European Society of Cardiology guidelines on CVD prevention in clinical practice[10]	Treatment with blood pressure- and/or lipid-lowering therapy is dependent on age-specific treatment targets and age-specific 10-year risk thresholds: ≥7.5% for <50 years, ≥10% for 50–69 years, ≥15% for ≥70 years. Treatment considered at 2.5 to <7.5% for <50 years, 5 to <10% for 50–69 years, 7.5 to <15% for ≥70 years[A]
Norway	New guidelines for the prevention of CVD (2017)[11]	Age-specific 10-year risk thresholds for lipid- and/or blood pressure-lowering treatment: ≥5% for 45–54 years, ≥10% for 55–64 years, ≥15% for 65–74 years
USA	2019 American College of Cardiology and American Heart Association guideline on the primary prevention of CVD[12]	Lipid-lowering treatment at ≥20% 10-year risk with treatment considered for ≥7.5 to <20% if risk-enhancing factors are present (treatment discussed if risk is 5 to <7.5% and risk-enhancing factors are present)
Japan	Japan Atherosclerosis Society guidelines for prevention of atherosclerotic CVD 2017[13]	Lipid-lowering treatment considered for all risk categories if 3–6 months of behaviour modification is ineffective
Global	Prevention of CVD: Guidelines for assessment and management of cardiovascular risk (2007)[14]	>30% 10-year risk with lipid- and/or blood pressure-lowering treatment. Considered at 20–30% risk if behavioural strategies are inadequate

[A]Recommendations are for healthy people. Different recommendations apply to people with established cardiovascular disease (CVD), diabetes, chronic kidney disease or familial hypercholesterolaemia.

PubMed and the Cochrane Library using a combination of terms (ie cardiovascular disease, vascular disease, drug therapy, treatment, statins, primary prevention and prevention) for studies published between January 2012 and July 2021. We included systematic reviews and meta-analyses, randomised controlled trials (RCTs) and modelling studies (where treatment effects were derived from RCTs) reporting the effects on fatal and non-fatal CVD outcomes of initiating blood pressure- and/or lipid-lowering treatments at different levels of risk estimated using risk prediction equations. We also reviewed citation lists of included publications and citations in international CVD guidelines updated since 2012. We assessed the quality of the included articles using published tools but were unable to evaluate the quality of meta-analyses due to a lack of appropriate published tools.[17–20]

Evidence on the clinical effects of initiating blood pressure-lowering medication at different CVD risk levels

We identified six studies (two meta-analyses,[21,22] three single-blinded RCTs[23–25] and one modelling study[26]) reporting on the effects of blood pressure-lowering treatment at different baseline levels of CVD risk.

The two largest studies, both of which were primarily restricted to people with high blood pressure, were a 2014 meta-analysis[22] (68 trials; n=245,870; proportion with existing CVD not reported) and a 2018 meta-analysis of individual participant data from the Blood Pressure Lowering Treatment Trialists' Collaboration[21] (BPLTTC; 11 trials; n=47,872; 35,671 [75%] without prevalent CVD and 12,201 [25%] with prior CVD). The results outlined below are for all participants (those with and without CVD), as neither trial provided relevant results stratified by CVD status at baseline.

Both meta-analyses showed that blood pressure-lowering medication reduces the risk of CVD events across all levels of

estimated risk,[21,22] with results from the BPLTTC analysis showing a risk reduction of around 18–22% for major CVD, even at lower levels of risk.[21] Data indicated that initiating treatment in those with a five-year risk >10% would treat a similar number of people as initiating treatment in those with systolic blood pressure ≥160 mmHg.[21] Under the 2012 Australian CVD guideline, treatment was recommended for those with blood pressure persistently ≥160/100 mmHg.[15] The number needed to treat (NNT) for five years to avoid one CVD event varied by type of CVD outcome but typically increased gradually with decreasing CVD risk level, with the exception of the lowest CVD risk category in the 2014 meta-analysis, where treating those at <5% 10-year CVD risk required a much larger NNT (ranging from 152 for a composite outcome of stroke, coronary heart disease and heart failure to 806 for heart failure only) than other risk categories.[22] For a broad composite CVD outcome, around 28 people needed to be treated at >15% five-year risk to avoid one CVD event, while the NNT was approximately 33 at >10%, 38 at >7.5% and 46 at >5% five-year risk.[21]

All other studies had small sample sizes (n<5000), except for a modelling study, which only included data for China and India.[26] The only Australian study available was an RCT with limited power, reporting hazard ratios for a single type of blood pressure treatment (chlorothiazide) across five-year CVD risk treatment thresholds (low risk <6.1%; moderate risk 6.1–17.0%; high risk >17.0%) that were not comparable to those used in other studies or the 2012 Australian guideline.[25]

Evidence on the clinical effects of initiating lipid-lowering medication at different CVD risk levels

We identified one meta-analysis[2] and six modelling studies[27–32] examining lipid-lowering therapies at different levels of CVD risk.

The meta-analysis used individual participant data from 174,149 people (69,959 without a history of vascular disease) from 27 trials contributing to the Cholesterol Treatment Trialists' Collaboration, conducted before the end of 2009.[2] When restricted to participants without a history of vascular disease, overall, a 1.0-mmol/L reduction in low-density lipoprotein (LDL) cholesterol was associated with a 25% reduction in the likelihood of a major vascular event (rate ratio [RR]: 0.75; 95% confidence interval [CI]: 0.70–0.80).[2] There was some evidence that the relative risk reduction of major vascular events differed across levels of CVD risk (test for trend, $P<0.01$), although the RRs in the lowest two risk categories (<5% and 5% to <10%) were at least as large as those observed within the highest risk categories (RRs for major vascular event: 0.61 [95% CI: 0.45–0.81] for <5% five-year risk, 0.66 [95% CI: 0.57–0.77] for 5% to <10% risk and 0.83 [95% CI: 0.58–1.18] for ≥30% risk).[2]

Among participants with and without vascular disease, a 1.0-mmol/L LDL reduction with statin treatment was estimated to prevent six major vascular events per 1000 treated over five years for those with <5% five-year risk, 15 for 5% to <10% five-year risk and 31 for 10–20% five-year risk.[2] NNTs were not reported.

Only one of the six modelling studies included data relevant to Australia and was assessed as high quality.[30] The modelling suggested age- and sex-specific 10-year CVD risk treatment thresholds for Australia where benefits outweighed harms, ranging from 11% for men aged 40–49 years (approximately equivalent to 5–6% five-year risk) to 17% for those aged 70–75 years (an approximate 8–9% five-year risk) and from 15% 10-year risk for women aged 40–49 years (an approximate 7–8% five-year risk) to 18% for those aged 70–75 years (an approximate 9% five-year risk).[30]

Overall, the international evidence demonstrates that lipid-lowering treatment decreases the relative risk of major CVD outcomes by approximately 25% in those without a history of vascular disease, and there is little evidence that this relative reduction differs across risk category. However, there is little contemporary data available and very little data specific to Australia's context.

Conclusion

The current available global evidence indicates that both blood pressure- and lipid-lowering therapy are effective at reducing CVD events across all levels of CVD risk and that a five-year risk treatment threshold of around 6–10%, consistent with recommendations in major international guidelines, is associated with a modest NNT to prevent one CVD event. For example, for blood pressure-lowering medication, 33 people need to be treated to prevent one CVD event at a five-year risk level of >10%, while for lipid-lowering therapy, a 1.0-mmol/L reduction in LDL cholesterol would prevent approximately 15–31 major vascular events per 1000 treated for those with a five-year CVD risk of 5–20%.

Our review did not explicitly consider adverse events and the included studies did not comprehensively report on potential treatment harms. Limitations of the evidence synthesised included limited contemporary and Australian data; differences in definitions of CVD outcomes hampering between-study comparisons; most studies contributing to the included blood pressure-lowering meta-analyses being restricted to people with high blood pressure; lack of reporting on risk equation calibration, which influences the level at which the risk treatment threshold should be set; and most studies lacking statistical comparison of outcomes between different CVD risk levels.

Our review informed the 2023 Australian guideline recommendations for initiating preventive pharmacotherapy for those at high risk (≥10% five-year risk based on the new calculator), consideration of treatment for those at intermediate risk (5% to <10% five-year risk) and generally not offering pharmacotherapy to those at low risk (<5% five-year risk).[4] The Guideline Expert Steering Group considered evidence from this review as well as consensus on safety of medicines, contextual factors around medicine availability, affordability, and patient values and preferences.

Key points

- This article outlines methods and evidence used to inform risk treatment threshold recommendations for CVD primary prevention in Australia.
- This work was commissioned by the National Heart Foundation of Australia, on behalf of the Australian Chronic Disease Prevention Alliance, as part of the

2023 update of the Australian CVD risk assessment and treatment guideline.

- The NNT with blood pressure-lowering treatment for five years to avoid one CVD event increased gradually with lower CVD risk levels (ie 28 NNT at >15% five-year risk, 38 at >7.5% and 46 at >5%).
- For lipid-lowering therapy, a 1.0-mmol/L reduction in LDL cholesterol would prevent approximately six major vascular events per 1000 treated for those with <5% five-year risk, with 15 and 31 events prevented for those at 5% to <10% and 10–20% five-year risk, respectively.
- International evidence supports a 6–10% five-year risk treatment threshold for initiating pharmacotherapy for primary prevention of CVD events.

Authors

Mai TH Nguyen[A] MSc, GradCertBiostatistics, Research Assistant, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT

Sinan Brown[A] MPH, Research Assistant, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT

Emily Banks AM, MBBS (Hons I), BMedSci (Hons I), PhD, FAFPHM, FAHMS, Professor of Epidemiology and Public Health, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT

Mark Woodward PhD, FMedSci, FAHMS, FESC, Chair of Statistics, Epidemiology and Women's Health, The George Institute for Global Health, Imperial College London, London, UK; Professor of Medical Statistics, The George Institute for Global Health, University of New South Wales, Sydney, NSW

Yuehan Zhang PhD, Research Fellow, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT

Natalie Raffoul BPharm (Hons), GradCertPharmMed, MHM, Senior Manager, Healthcare Programs and Clinical Strategy, National Heart Foundation of Australia, Sydney, NSW

Garry Jennings AO, MD, FRCP, FRACP, FAAHMS, FCSANZ, FHBPRCA, FAHA, FESC, Chief Medical Advisor, National Heart Foundation of Australia, Melbourne, Vic; Honorary Professor of Medicine, The University of Sydney, Sydney, NSW

Anushka Patel MBBS, SM, PhD, FRACP, FAHMS, GAICD, Chief Executive Officer, The George Institute for Global Health, University of New South Wales, Sydney, NSW; Scientia Professor, Faculty of Medicine, University of New South Wales, Sydney, NSW

Ellie Paige PhD, Team Head, Cardiovascular Disease Prevention, QIMR Berghofer Medical Research Institute, Brisbane, Qld; Visiting Fellow, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT

[A]Equal first authors.

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Correspondence to:
Ellie.Paige@qimrberghofer.edu.au

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correspondence **ajgp@racgp.org.au**

A philosophical approach to mental health

Paul Allin

BEFORE THE advances of modern medicine, how did our ancestors deal with mental illness? Charles Caleb Colton (1777–1832) believed that there were three ways to bear the ills of life: by indifference, by philosophy and by religion.[1]

Philosophy played a large role in assisting those of our ancestors who were literate in managing mental illness, and we are fortunate that much that was written by philosophers in those early days is still available to us today, but do we pay enough respect to their teachings? Do we tend to provide a 'quick fix' prescription rather than guiding our patients through the many other things that they can do other than take medication? One in six Australians (4.8 million people) were prescribed a mental health medication in 2022, and 73% of these prescriptions were for antidepressant medication.[2]

There is plenty of evidence showing that modern antidepressants and anxiolytics are beneficial, but these medications have variable efficacy and a multitude of side effects.[3] The product information for sertraline lists over 40 side effects, and over 80 more were added in the post-marketing period (https://labeling.pfizer.com/showlabeling.aspx?id=517#section-6, Zoloft product information; New York City, NY, USA: Pfizer, 1991).

Do we ensure that we are doing the best thing for a patient by prescribing medications that will be efficacious and free of side effects and by always checking that they are necessary?

A pharmacogenomic screen may assist in guiding medication use, but in the author's experience, such tests are not commonly used in practice, and they are also not funded by Medicare. There may be a case for performing such a screen on any patient who is to be prescribed long-term medications, particularly if there has been a failed response to treatment.[4]

Anxiety, depression and post-traumatic stress disorder all benefit from non-medication approaches (Tables 1 and 2), and these illnesses are often intertwined with related disorders, such as insomnia, stress and chronic pain. All these conditions are intensely personal, and because of this, their management rests largely on what the individual does to manage them.[5–10]

The concept of brain dialysis

Brain dialysis consists of all the things that we must do to stay free of mental illness.[11] It is not only useful for prevention, but also for treatment. Self-belief, self-discipline, learning from mistakes, anger management, aspiration, change management, meditation, mindfulness, relationship management and a healthy lifestyle all form part of brain dialysis and were all topics covered by the philosophers.

Conclusion

A philosophical approach to managing mental illness is not a substitute for medication, but it is a tool that augments the overall management of a patient with a mental health illness and contributes to a holistic approach to their care. Finding the correct balance between the use of medication and the use of non-medication methods is an art, and as general practitioners, we should be coaches who guide our patients through the many options that are available for their individual circumstances.

Author

Paul Allin MBChB, LRCP, LRCS, LRCP&S, DOH, FRACGP, Honorary Clinical Associate Professor, Wollongong Graduate School of Medicine, University of Wollongong, Wollongong, NSW; General Practitioner, North Nowra Medical Practice, North Nowra, NSW

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Correspondence to:
paul@nnm.net.au

Table 1. The non-medication management of depression

Key points in managing depression[11]	Philosophers' advice for depression
• You must fight depression head on to beat it. Be active, not passive. (Philosophy) • Mindfulness, behavioural change and meditation are effective. (Psychology) • Keep a healthy lifestyle: exercise every day, pay attention to sleep hygiene, avoid excessive use of caffeine, alcohol and all recreational drugs. (Lifestyle) • Use green and blue spaces for exercise, hobbies and relaxation. (Lifestyle) • Make yourself do something that you enjoy every day. (Philosophy) • Keep a routine to make sure you do what you must do each day. (Philosophy) • Keep your priorities in the order that they should be in; put yourself first in anything you do in life but in a selfless way, not a selfish way. (Philosophy) • Never look backwards. Do not let negative thoughts and thinking take over. (Philosophy) • Learn from your mistakes, they are a positive thing; you learn much more from losing than you do from winning. (Philosophy) • Do not be hard on yourself when things get tough; that is when you are most likely to make a mistake, but also when you will learn the most. (Philosophy) • Pain can be your best teacher – mental pain much more than physical pain. (Philosophy) • Maintain a vision for your future and be ambitious; hope, ambition, aspiration and purpose all fly in the face of depression. (Philosophy) • The management of depression is multifaceted; try different things.	• Everything is hard before it is easy. Goethe (1749–1832) • The longer we dwell on our misfortunes, the greater is their power to harm us. Voltaire (1694–1778) • If you are in a bad mood, go for a walk. If you are still in a bad mood, go for another walk. Hippocrates (460–370 bc) • Through self-discipline comes freedom. Aristotle (384–322 bc) • A wise man should consider that health is the greatest of all human blessings, and learn how, by his own thought, to derive benefit from his illnesses. Hippocrates (460–370 bc) • Anybody can become angry – that is easy. But to be angry with the right person and to the right degree and at the right time and for the right purpose, and in the right way – that is not within everybody's power and is not easy. Aristotle (384–322 bc) • It is during our darkest moments that we must focus to see the light. Aristotle (384–322 bc) • Suffering becomes beautiful when anyone bears great calamities with cheerfulness, not through insensibility but through greatness of mind. Aristotle (384–322 bc) • Great is the power of habit. It teaches us to bear fatigue and to despise wounds and pain. Cicero (106–43 bc) • He who has a why to live can bear with almost any how. Nietzsche (1844–1900)

Table 2. The non-medication management of stress and anxiety

Key points in managing stress and anxiety[11]	Philosophers' advice for anxiety
• Manage the things you can manage and try to ignore the things you cannot. (Philosophy) • Anxiety is normal, but it needs to be controlled to keep it working for you and not against you. (Psychology) • Reduce screen time. (Lifestyle) • Keep a balance in life and do not bring work home, both in a mental sense as well as in a physical sense. (Lifestyle) • Work on managing insomnia. (Lifestyle) • Avoid excessive use of alcohol, caffeine and all recreational drugs. (Lifestyle) • Keep your thinking brain in charge and practise methods to stop your subconscious brain taking over, such as meditation, mindfulness, breathing and relaxation techniques. (Psychology) • Avoid non-helpful behaviours and thinking. (Psychology) • The management of anxiety is multifaceted; try different things.	• Nothing in the affairs of men is worthy of great anxiety. Plato (428–348 bc) • There is only one way to happiness, and that is to cease worrying about things which are beyond the power of our will. We have no power over external things, and the good that ought to be the object of our earnest pursuit is to be found only within ourselves. Epictetus (50–135) • The greatest weapon against stress is our ability to choose one thought over another. William James (1842–1910)

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correspondence **ajgp@racgp.org.au**

Median arcuate ligament syndrome: When to consider the diagnosis and management options

Vidushi Lal, Lucy Guazzo

Background
Median arcuate ligament syndrome (MALS) occurs due to extrinsic compression of the coeliac plexus, leading to postprandial and exercise-induced epigastric pain, nausea, vomiting, food fear and weight loss. Diagnosis can be challenging as up to 25% of the population have radiological compression. However, only 1% of the population have corresponding symptoms. The duration between the onset of symptoms and diagnosis of MALS can extend up to years. Primary care physicians are commonly the first people to encounter patients with MALS and play a vital role in its assessment, diagnosis and management and the coordination of subspecialty care.

Objective
The aim of this article is to provide general practitioners with a review of the current literature, summarise a diagnostic pathway and propose a treatment algorithm for MALS.

Discussion
MALS is a rare cause of debilitating abdominal pain with no single 'rule in test'. It often affects young patients and leads to significant morbidity and poor quality of life. Increased awareness of MALS in the primary care setting allows for earlier consideration and investigation as part of the diagnostic work-up for patients with symptoms of abdominal pain not attributable to more common conditions.

MEDIAN ARCUATE ligament syndrome (MALS) refers to the external compression of the coeliac plexus by the median arcuate ligament (MAL) with resulting symptoms.[1] Compression alone is a common radiological finding in approximately 25% of the population; however, only 1% of the population have corresponding symptoms.[2] Diagnosis can be difficult due to the wide differential for abdominal pain, specifically in the younger population. The clinical presentation can include postprandial abdominal pain, nausea and vomiting, food fear, constipation or diarrhoea, and weight loss.[1]

The MAL is the fibrous edge of the diaphragmatic crura, which passes over the aorta at the level of the first lumbar vertebral body, superior to the origin of the coeliac axis (Figure 1).[3] In some patients, a low diaphragmatic insertion of this ligament from an anomalous fibrous diaphragmatic band can compresses the coeliac artery.[1] Chronic compression by this ligament can lead to hyperplastic intimal changes of the coeliac artery.[1] This might progress to cause stenosis or complete arterial occlusion, along with post-stenotic dilation and coeliac artery aneurysms.[1]

Pathophysiology

The pathophysiology of MALS is unclear, and multiple theories have been discussed in the literature.[1,4] It is thought that the compression of the coeliac artery can cause foregut pain and ischaemia during increased demand when patients eat.[4] This is somewhat contrary to the understanding that symptoms of chronic mesenteric ischaemia rarely occur secondary to isolated coeliac occlusive disease due to the rich collateral network of the mesenteric vessels.[1,5] However, a prospective study in 2006 found that a positive gastric tonometry should be used to identify patients who would benefit from MALS release, suggesting that severe coeliac artery compression can result in ischaemic symptoms.[6]

Some postulate that a steal phenomenon occurs due to significant collateral circulation causing blood to be diverted away from the midgut to the foregut following meals, resulting in midgut ischaemia and pain.[4]

Further theories include that overstimulation of the coeliac plexus causes significant vasoconstriction, which results in ischaemic abdominal pain and the entrapment of the coeliac ganglion, altering gastric myoelectrical activity, impairing antral motility and causing neurogenic pain.[4]

Who is affected by MALS?

The prevalence of MALS remains unclear, which is partly due to its variable clinical presentation.[1] There is a tendency towards women (4:1), and the median age is between 30 and 50 years.[1] Cases have also been reported in paediatric populations.[1,4] Furthermore, the literature describes an emerging theme of anxiety and mood disorders being higher in those with MALS.[1,7]

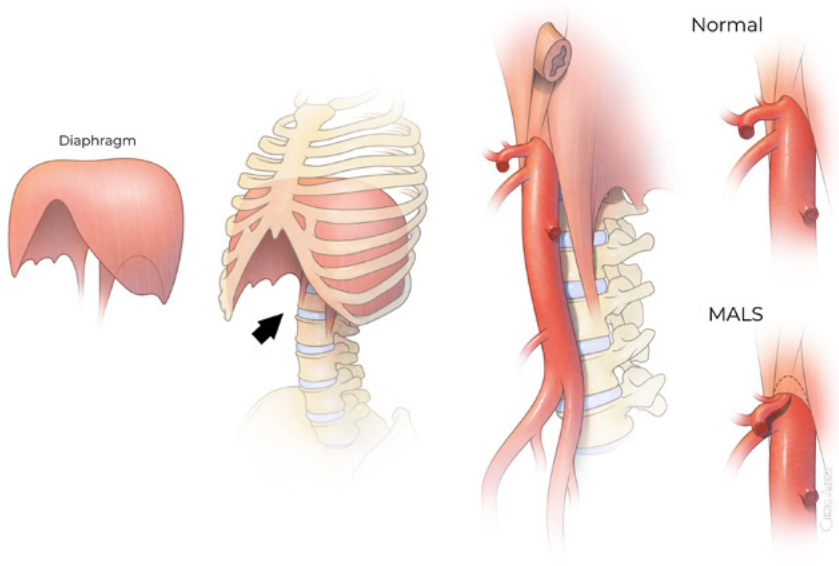

Figure 1. Illustration of median arcuate ligament syndrome (MALS). Patients experience severe compression of the coeliac artery, the first large branch from the aorta, as it enters the abdomen. This compression is typically worse during deep expiration.

Reproduced from The University of Texas Health Science Center at Houston (UTHealth). Median arcuate ligament syndrome (MALS). UTHealth, 2022. Available at https://med.uth.edu/cvs/patient-care/conditionsandprocedures/median-arcuate-ligament-syndrome-mals, with permission from The University of Texas Health Science Center at Houston.[3]

Primary care assessment

The primary presenting symptom of MALS is abdominal pain. Determining a diagnosis for chronic abdominal pain can be challenging due to the broad differentials and extensive work-up required, along with the significant effects on the patient's quality of life. It can be an expensive burden both for the healthcare system and patients.[8] Many patients are left with debilitating symptoms without a specific diagnosis, which can cause significant psychological distress.[8]

MALS occurs most commonly in young women. They describe abdominal pain, weight loss, bloating, nausea and vomiting, which can be related to eating and drinking or be exercise induced. A thorough history should be taken as to whether they have had previous abdominal surgery (eg diagnostic laparoscopy or cholecystectomy) and whether they have any other symptoms of autonomic disorders (eg postural orthostatic tachycardia syndrome).[4]

On physical examination, patients are classically slim with no significant abdominal pain on palpation. An epigastric bruit increased with expiration might be present.[4] There are no known approaches to elicit the symptoms for diagnosis.

MALS does not have universally accepted diagnostic criteria.[1] However, it is a diagnosis that remains one of relative exclusion and is typically the result of extensive investigations to exclude more common, alternative causes of abdominal pain.[1,4]

Recommended work-up includes targeted blood tests (full blood count and liver function, renal function and lipase/amylase tests), urinary culture, biliary ultrasound, and upper and lower endoscopies with *Helicobacter pylori* testing and food allergy testing, including coeliac disease. Progression to multidetector computed tomography (CT) and gastrointestinal motility testing might be indicated.[1] If these tests provide abnormal results, appropriate referral should be made to confirm an alternative cause of abdominal pain.[1] If the above investigations are normal, along with a finding of coeliac artery compression, a diagnosis of MALS should be considered and the patient would benefit from multidisciplinary input, including from a gastroenterologist and a vascular surgeon.

Specialist assessment

Suspicion of MALS on history and radiological evidence is sufficient to refer on to a surgeon. However, to avoid delay to patient care, ruling out more common pathologies, the above investigations and gaining gastroenterology specialist opinion are recommended.
In Australasia, MALS is primarily diagnosed and managed by vascular surgeons, with interventions offered by general and vascular surgeons as well as interventional radiologists and pain specialists, depending on the patient's needs.

Evidence of coeliac artery compression alone on CT is not diagnostic of MALS.
CT can be used to evaluate the structural elements of the coeliac artery and the MAL, as well as highlight evidence of post-stenotic dilation or aneurysms.[1,4] Features of coeliac compression on a CT include focal narrowing of the proximal coeliac artery with a characteristic hooked appearance (Figure 2). This 'hooking', along with the absence of calcified plaques, helps differentiate MALS stenosis from atherosclerotic narrowing.[1,5,9]
CT allows for the assessment of the other mesenteric vessels, collateral supply along with potential aneurysmal changes within the collateral networks, and other causes

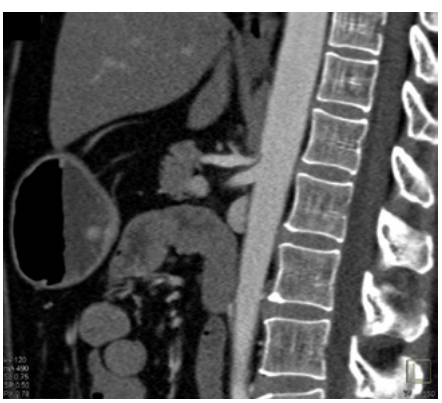

Figure 2. Classic hooked appearance of median arcuate ligament compressing the proximal coeliac artery, as seen on computed tomography angiography.

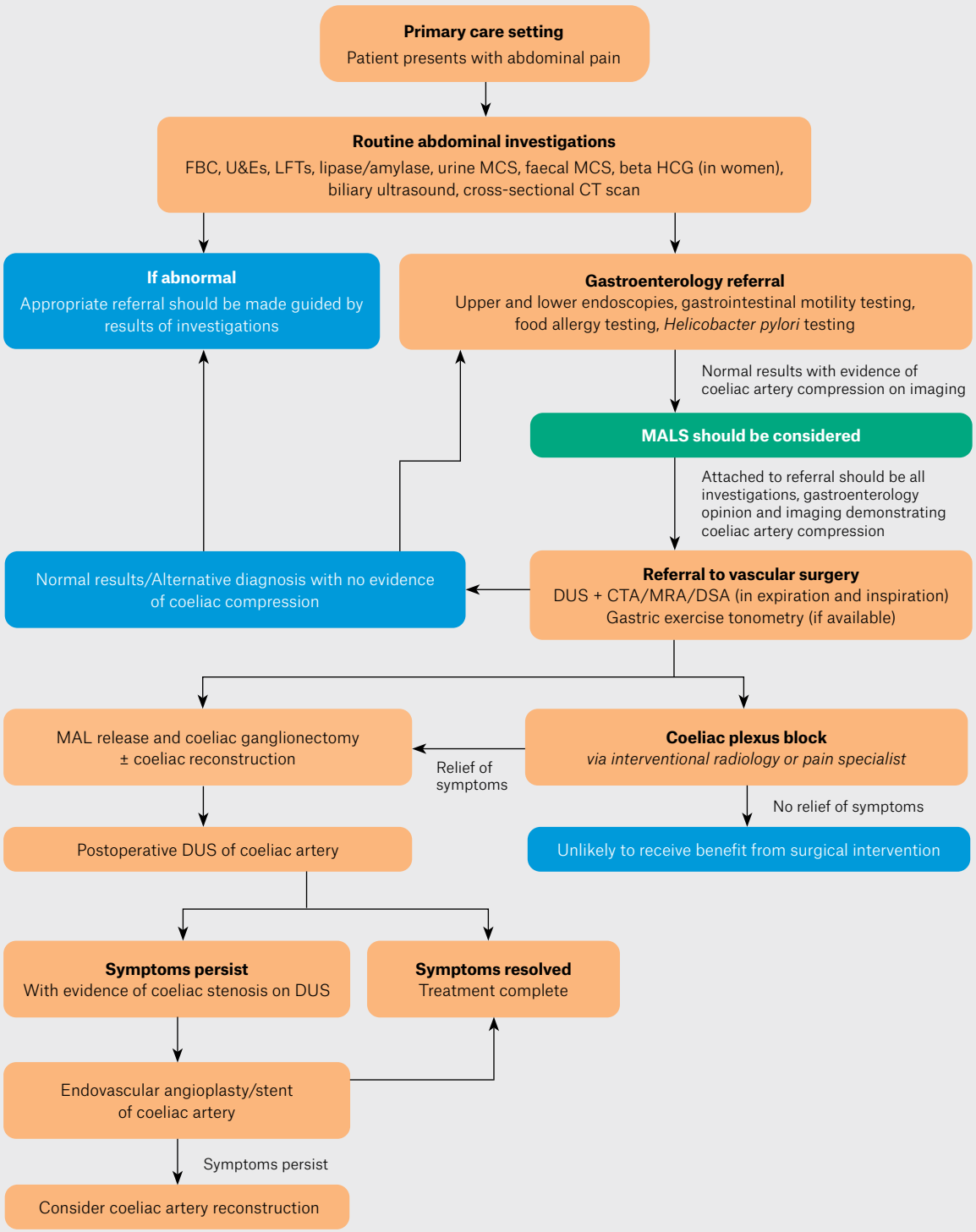

Figure 3. Proposed median arcuate ligament syndrome (MALS) work-up and treatment pathway.

CT, computed tomography; CTA, computed tomography angiography; DSA, digital subtraction angiography; DUS, Doppler ultrasound; FBC, full blood count; HCG, human chorionic gonadotropin; LFTs, liver function tests; MAL, median arcuate ligament; MALS, median arcuate ligament syndrome; MCS, microscopy, culture and sensitivity; MRA, magnetic resonance angiography; U&Es, urea and electrolytes.

of abdominal pain. Its limitation is that it is not a dynamic investigation, which is an important factor when diagnosing MALS.

Duplex ultrasound, performed by an experienced vascular sonographer, can provide accurate measurements of coeliac artery compression during rest, inspiration and expiration.[10,11] Dynamic testing can also be performed by vascular surgeons via digital subtraction angiography, demonstrating narrowing or change in the coeliac artery during respiration.[1]

Further diagnostic tests are still being evaluated, such as gastric exercise tonometry.[5] If the gastric fluid is more acidic post exercise, this suggests significant coeliac artery compression or ischaemia.[4] Reilley et al demonstrated improved outcomes in patients who undergo coeliac decompression when they have coeliac compression and positive gastric tonometry testing compared to those who have a negative tonometry.[6]

Treatment

If appropriate, intervention for MALS requires a multidisciplinary approach, including vascular surgery, general surgery, pain specialists and interventional radiology.

Coeliac plexus block is a non-surgical option for relief from MALS that can also aide as a diagnostic test.[1,4,12] Coeliac plexus block involves an interventional radiologist or a pain specialist injecting local anaesthetic or a neurolytic agent directly into the coeliac plexus with imaging guidance. If the patient receives transient relief from intervention, this further supports a MALS diagnosis and might encourage surgeons to proceed to surgery.[13]

The surgical treatment of MALS includes decompressing the artery and performing a coeliac ganglionectomy.[1,4] Decompression of the coeliac artery was traditionally performed through a laparotomy but is now more commonly performed via laparoscopically or robot-assisted laparoscopic release.[13] In some cases, however, coeliac artery reconstruction might be indicated.

Endovascular stenting or angioplasty alone is deemed ineffective for MALS, as the extrinsic compression of the MAL might cause stenosis, fractures or migration of the stent. However, endovascular therapies have been used in patients with persistent stenosis of the coeliac artery post decompression.[1]

Unlike chronic mesenteric ischaemia caused by atherosclerosis, antiplatelet and cholesterol lowering tablets are not usually indicated for MALS. However, if performing coeliac artery reconstruction or coeliac artery angioplasty for recurrent stenosis post coeliac decompression, these medications are recommended to prevent neointimal hyperplasia.

On reviewing the literature, we have proposed a diagnostic and treatment pathway (Figure 3).

Conclusion

MALS is a rare cause of abdominal pain that lacks defined diagnostic criteria. Those affected by MALs are often young, and it can cause significant morbidity. Testing in the primary care setting, as outlined in this article, is recommended to exclude other causes of abdominal pain and allow for subsequent referral. Due to the challenges in both diagnosis and treatment of MALS, multidisciplinary care involving general practitioners along with subspecialists is vital for successful outcomes. Those with MALS who have appropriate work-up, diagnosis and management have been found to have good outcomes in case series. Further consensus on diagnostic criteria and management is required. Regardless, an increased awareness of MALS would permit earlier consideration and investigation of the syndrome as part of a diagnostic work-up for patients with symptoms of abdominal pain and weight loss not attributable to more common conditions.

Key points

- MALS is rare, and diagnosis can be challenging, with only 25% of the population having radiological compression and only 1% of the population having corresponding symptoms.
- MALS is a diagnosis of exclusion and is typically the result of extensive investigations to exclude more common, alternative causes of abdominal pain.
- Postprandial and post-exertional abdominal pain in young women without an alternative diagnosis should undergo investigation for MALS via Doppler ultrasound, computed tomography angiography and, if available, gastric tonometry.
- The pathophysiology of MALS is unclear but is likely an interplay between coeliac artery and coeliac ganglion compression.
- Coeliac plexus block, open surgical or laparoscopic MAL release and coeliac ganglionectomy have been found to be effective. However, the durability of symptom relief is variable.

Authors

Vidushi Lal MD, MS, Principal House Officer, Department of Vascular Surgery, Royal Brisbane and Women's Hospital, Herston, Qld

Lucy Guazzo MBBS, FRACS, Vascular Surgeon, Staff Specialist, Department of Vascular Surgery, Royal Brisbane and Women's Hospital, Herston, Qld; UQ-HBI Senior Partnership, School of Medicine, University of Queensland, St Lucia, Qld

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Correspondence to:
Vidushi.lal@health.qld.gov.au

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correspondence **ajgp@racgp.org.au**

Adult-onset dysphagia

Fred Chuang, Rohan Arasu, Gavin Quail, Stephen Johnston

Background
Dysphagia, characterised by a difficulty in swallowing, stems from various causes and is frequently encountered in general practice. The rise in dysphagia in Australia's ageing population necessitates proper management to prevent complications. Recognising and managing dysphagia improves outcomes and quality of life, and reduces secondary complications.

Objective
This article assists physicians through the work-up and management of dysphagia.

Discussion
Dysphagia, resulting from upper aerodigestive tract disruptions, can be categorised anatomically (oropharyngeal, oesophageal) or by pathophysiology (motility, obstructive). It imposes a substantial community disease burden with high morbidity and mortality rates. Dysphagia might lead to aspiration, malnutrition and poor mental health. A holistic approach involving primary and tertiary specialists, allied health, family and carers is vital. Depending on the aetiology, dysphagia is often treated conservatively in the community; however, complex cases often require a multifaceted approach and integration of multiple specialties.

DYSPHAGIA PRESENTS with a vast array of aetiologies and is a common presenting complaint in the general practice setting.[1] In addition to being a potential symptom of malignancies, dysphagia represents a common chronic disability within our ageing Australian population.[2] Timely recognition and early management of dysphagia have been shown to improve patient outcomes and quality of life and to reduce hospitalisations from secondary complications.[3,4]

Aim

This article provides an overview of dysphagia to support general practitioners (GPs) in terms of assessment, common treatment options and the recommended management pathways.

Epidemiology

Dysphagia is a complex anatomical and/or functional disruption of the aerodigestive tract resulting in a poor swallow.[5]

Causes of dysphagia can be broken down into two broad categories relating to the affected anatomical location – oropharyngeal or oesophageal dysphagia – and similarly by its pathophysiology either being a motility disorder or an obstructive disorder.[5] A list of differential diagnoses and their categorisations can be found in Table 1.

Dysphagia carries a significant disease burden among our communities, with notably high morbidity and mortality rates,[6] although global reports vary with population-based incidences estimated to be between 2 and 20%.[7,8] Australian-specific reports reflect these data, indicating that 20% of Australians aged >50 years experience dysphagia, which increases to up to 50% in those residing in long-term care facilities.[6,8] Aspiration pneumonitis was the leading cause of death in people with a disability living in New South Wales residential care facilities in 2016.[9] Although multifactorial, risk factors in the geriatric population include previous strokes, dementia and occasionally motor neurone disease. Dysphagia is more prevalent in women than men across all age groups.[5,10]

Overview and subtypes of dysphagia

Oropharyngeal dysphagia

Oropharyngeal dysphagia relates to either a dysmotility or a mechanical obstruction at or above the level of the upper oesophageal sphincter (UES).

Several neurological conditions can result in dysmotility. Central causes include cerebrovascular accidents (CVAs) and neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease. Peripheral causes include diabetic

Table 1. Differential diagnoses of dysphagia

Oropharyngeal pathology		Oesophageal pathology	
Mechanical obstructions			
Oropharyngeal malignancy	Squamous cell carcinoma is the most common cause of head and neck malignancy. Other cancers include lymphoma and salivary gland tumours	Oesophageal malignancy	Adenocarcinomas are the most common oesophageal malignancy, with dysphagia usually presenting as a sign of late-stage disease
Pharyngitis and abscess formation	Laryngitis, pharyngitis and tonsilitis might progress into parapharyngeal or deep neck space infections	Peptic/Oesophageal stricture dysfunction	Stricture formation secondary to chronic gastric reflux is treated by endoscopic dilatations and gastric acid suppression
Pharyngeal diverticulum	Zenker's diverticulum is the most common pharyngeal diverticulum due to a spasmodic upper oesophageal sphincter resulting in a high-pressure pharynx. This can often be identified in barium swallow studies in the community	Schatzki ring	A pathological narrowing of the distal oesophageal lumen. The pathophysiology is still unclear
Radiation injury	Post-radiotherapy side effects for head and neck cancer treatment include mucositis, xerostomia, fibrosis and strictures. Regular gum chewing to promote salivation, increasing daily fluid intake and using oral lubricants might help with xerostomia. Strictures can be seen on barium swallows and will require endoscopic dilatation	Foreign body	Patients present with hypersalivation, odynophagia and bolus regurgitation. Endoscopic treatment is only considered when medical therapies such as glucagon, benzodiazepines, calcium channel blockers and carbonated liquids have failed
Cervical vertebral osteophytes	Osteophytes commonly seen on barium swallows might protrude into pharyngeal mucosa creating discomfort during the transfer of a food bolus. Osteophytectomy is not routinely recommended		
Thyroid goitre/cancers	Thyroid goitre results in extrinsic compression of the upper aerodigestive tract. Sonographic and CT neck and chest scans are helpful initial investigations		
Motility disorders			
Stroke	Central disorders result in dyscoordination of pre-oral, oral and pharyngeal phases of swallowing. Reflexive swallow is delayed, bolus propulsion is blunted, and airway protection is limited	Eosinophilic oesophagitis	A chronic relapsing food-related inflammatory disorder results in over deposition of eosinophils and subsequent oesophageal fibrosis. Treatment involves targeted allergenic food avoidance and topical corticosteroids

Table continued on the next page

neuropathy or myasthenia gravis.[11,12] CVAs are the leading cause of oropharyngeal dysphagia, and are also associated with a higher risk of aspiration due to an uncoordinated swallow and an inability to protect the airway. As a result, up to one-third of stroke survivors will develop aspiration pneumonia in their first month of recovery.[13] Dysphagia related to neurological disorders is often chronic and can result in significant disability, especially within the institutionalised geriatric population.[14–16]

The most common mechanical obstruction of the oropharynx includes benign or malignant lesions of the head and neck (H&N), strictures, post-radiation changes and external compressive pathologies (ie goitre, cervical osteophytes).

The most common malignancy of the oropharynx is squamous cell carcinoma (SCC), which accounts for >90% of H&N malignancies.[17] These SCCs can be classified as non-human papillomavirus (HPV)-related SCCs, commonly associated with tobacco smoking and heavy alcohol use, or by HPV-associated SCC, which is steadily rising in incidence.[18]

Table 1. Differential diagnoses of dysphagia (cont'd)

Oropharyngeal pathology		Oesophageal pathology	
Parkinson's disease	Dysphagia secondary to muscular rigidity and bradykinesia increases the likelihood of silent aspiration. Swallow assessments and rehabilitation with a speech pathologist is vital in slowing the progression of dysphagia	Achalasia	Achalasia results from an inappropriate contraction of the lower oesophageal sphincter
Alzheimer's disease	Dysphagic geriatric populations with dementia often develop malnutrition, dehydration, cachexia, social isolation and a general decline in quality of life	Distal oesophageal spasm	Distal oesophageal spasms result from rapid prolonged propagations of peristalsis resulting in oesophageal muscular hypertrophy over time
Amyotrophic lateral sclerosis	A progressive neurodegenerative disease affecting motor neurones of the central nervous system. This disease might manifest with progressive bulbar pathology. No reversible treatment options are available. Management revolves around swallow rehabilitation through a speech pathologist. These patients will require neurology and ENT input to manage sialorrhoea, reduce aspiration and improve communication		
Myasthenia gravis	Myasthenia gravis is a rare autoimmune inflammatory myopathy induced by antibody-associated destruction of neuromuscular endplates of voluntary muscle. Although many different muscles are affected, patients might describe 'fluctuating and fatigable swallowing'	Scleroderma	Scleroderma is an autoimmune disorder that results in the recomposition of oesophageal musculature into fibrotic aperistaltic tissue
Multiple sclerosis	Multiple sclerosis is an autoimmune demyelination disease of the central nervous system. Dysphagia is a prevalent symptom in these patients, though there is a paucity of evidence-based management options to guide clinicians	Autonomic neuropathy	The most common cause of autonomic neuropathy is diabetes mellitus, which results in dysregulation of the autonomic system
Functional dysphagia	Functional dysphagia is a diagnosis of exclusion and refers to a psychogenic aetiology that is not explained by other causes		
Laryngopharyngeal reflux	An impaired upper oesophageal sphincter results in gastric reflux irritating pharyngeal and laryngeal mucosa. Patients often complain of throat clearing		

CT, computed tomography; ENT, ear–nose–throat.

Oesophageal dysphagia

Oesophageal dysphagia relates to dysmotility or a mechanical obstruction below the level of the UES. The most common mechanical obstruction is a stricture secondary to gastroesophageal reflux disease (GORD).[19] Recurrent gastric acid reflux can result in oesophagitis, which can lead to benign peptic stricture development. Alternatively, GORD can also result in the dysplastic process of Barrett's oesophagus due to chronic irritation.[20] This histological change is a precursor to the development of oesophageal adenocarcinoma, which might result in progressive dysphagia, typically a sign of advanced disease.

Oesophageal motility disorders can be divided into primary oesophageal disorders or systemic diseases with a secondary effect on oesophageal motility. Achalasia is the most common motility disorder and is characterised by incomplete relaxation of the lower oesophageal sphincter, resulting in oesophageal aperistalsis.[21] Less common primary motility diseases include diffuse oesophageal spasm and nutcracker oesophagus.[22] The most common secondary oesophageal motility disorders are scleroderma and diabetic autonomic neuropathy, with both affecting the

Table 2. Key considerations for history-taking in the work-up of dysphagia

General history considerations		
Presenting complaint	Oropharyngeal likely	Oesophageal likely
	• Delayed swallow initiation[A] • Coughing, choking or nasal regurgitation[A,B] • Dysphonia,[A,B] otalgia[B] • Xerostomia[A] • Haemoptysis[B] • Exposure to HPV or high-risk sexual behaviours[B] • Recent intubation • Recurrent pneumonia	• Reflux or heartburn[A] • Bolus regurgitation[A,B] • Catching sensation in the throat or chest • Difficulty localising the level of obstruction[22] • Haematemesis[B]
	• Odynophagia[B] • New neck lumps or swelling[B] • Neurological deficits[A] • Food consistency: solid intolerance,[A,B] liquid intolerance[A]	
Constitutional symptoms	• Unexplained weight loss (>10% over a 6-month period)[B] • Generalised malaise and lethargy • Anorexia • Night sweats[B]	
Past medical history	• Central neuropathies: – Stroke or transient ischaemic attacks[A] – Alzheimer's disease[A] • Peripheral neuropathy[A] • Neurodegenerative diseases[A] • Gastroesophageal disease and peptic ulcer disease • Diabetes mellitus[A] • Thyroid disorders • Asthma[A]	
Medications: refer to Table 3		
Allergies	• Drug and food hypersensitivities	
Vaccinations	• Up-to-date and recommended travel vaccinations • COVID-19 vaccination status	
Family history	• History of head and neck cancers • History of autoimmune disorders	
Social	• Smoking history[B] • Alcohol consumption[A,B] • Dietary modifications • Assessment of activities of daily living – ECOG grading • Level of home assistance and food preparation independence	

[A]Dysmotility/physiological pathology.
[B]Obstructive pathology.
ECOG, Eastern Cooperative Oncology Group; HPV, human papillomavirus.

contractility of the oesophagus and resulting in aperistalsis.[23]

History-taking

A thorough history and examination is required for all patients with suspected dysphagia. Refer to Table 2 for a focused summary. For appropriate escalation and management, it is important to address two broad questions. First, whether the dysphagia involves the oropharyngeal or oesophageal region; and second, whether it is caused by a mechanical obstruction or a motility disorder.

Differentiating between locations

Oropharyngeal pathology will typically result in a delay in swallow initiation, coughing, choking or nasal regurgitation with food. Patients with oesophageal obstructions often have difficulty self-localising the level of obstruction; however, they might present with symptoms such as a catching sensation in the throat or the chest.[24] Important red flag symptoms associated with malignancy include odynophagia, otalgia, neck masses, unintentional weight loss and bloody expectoration.

Differentiating between mechanisms

The primary way to differentiate between an obstructive or a dysmotility disorder is by assessing for foods that trigger dysphagia. Motility disorders affect solid and liquid foods, whereas obstructive disorders are typically initially associated with solid foods and patients might report substituting their usual diet with pureed textured food. Many of the medications found in Table 3 can lead to and contribute to dysphagia.[25,26]

Clinical examination

The examination begins with assessing the symmetry of the face, neck and oral cavity, followed by palpation of the neck and supraclavicular region. The oral examination is performed with a tongue depressor and a light source with careful attention to the tonsils, tongue and the floor of the mouth. The clinician should also perform a cranial nerve examination and identify global or focal neurological pathologies. A focused examination can be found in Table 4.

Table 3. Medication-induced dysphagia

Category	Mechanism	Examples
Sedative drugs	• These drugs result in cognitive inhibition, resulting in oropharyngeal swallow dyscoordination • Elderly patients are more vulnerable to its effects	• Benzodiazepines: lorazepam, alprazolam, diazepam • Opiates: codeine, hydromorphone, fentanyl, oxycodone
Antipsychotics	• These drugs create an antagonistic effect on central nigrostriatal dopamine D2 receptors, which suppress all phases of deglutition	• Clozapine, haloperidol, lithium, olanzapine, quetiapine, risperidone
Xerostomia-related medications	• These medications have an inhibitory effect on the parasympathetic system, reducing salivary production, leading to xerostomia	• Angiotensin-converting enzyme: perindopril • Antiemetics: metoclopramide, ondansetron, promethazine, prochlorperazine • Decongestants: diphenhydramine, pseudoephedrine • Selective serotonin reuptake inhibitors: citalopram, fluoxetine, venlafaxine, paroxetine, sertraline, amitriptyline
Anticholinergics and antimuscarinics	• These medications have an inhibitory effect on the parasympathetic system that can result in the impairment of oesophageal peristalsis. These medications can also result in xerostomia	• Atropine, benztropine, hyoscine, ipratropium, oxybutynin
Medications that cause oesophageal mucosal injury	• Some medications might cause caustic irritation of the oesophageal mucosa and with overexposure, might lead to stricture formation	• Antibiotics: clindamycin, doxycycline, erythromycin • Bisphosphonates: alendronate, risedronate, zoledronic acid • Non-steroidal anti-inflammatory drugs: aspirin, ibuprofen, naproxen, indomethacin • Supplementary medications: iron-containing tablets, potassium chloride, vitamin C tablets

Investigations and management

The history and examination can reliably identify the location and mechanism of dysphagia, which then allows for targeted investigations and the appropriate referral pathway to be actioned. When obstructive oropharyngeal dysphagia is suspected, a referral to an ear–nose–throat (ENT) specialist should be made for a nasoendoscopy and biopsies, as required. Patients suspected of oropharyngeal malignancy also benefit from computed tomographic imaging of the neck and chest to assess for primary lesions and associated lymphadenopathy. Isolated enlarged lymph nodes require an ultrasound-guided biopsy for further histological assessment.

Any patient suspected of having oesophageal dysphagia must be referred to a gastroenterologist for an upper gastrointestinal endoscopy (UGIE) to exclude an oesophageal malignancy, with biopsies taken as required.[27] An UGIE will also assess for other benign obstructive pathologies.

Specialised investigation for motility disorders can be undertaken when mechanical obstructions are broadly excluded. A non-invasive study such as a barium swallow study is a helpful primary investigation that can be organised by the GP, which might demonstrate patterns of barium stasis within the oropharynx and oesophagus. Following this, more specialised testing can be considered. A speech pathologist can assist with further assessments of oropharyngeal motility disorders. They can organise specialised testing in the form of a video fluoroscope swallow study, which is a dynamic radiological assessment of swallow, assessed in a multidisciplinary fashion by both radiologists and speech pathologists.[28,29] Magnetic resonance imaging of the brain can help diagnose neurological diseases that might be contributing to oropharyngeal dysfunction. Certain gastroenterologists and general surgeons might arrange manometric testing to delineate between different oesophageal motility disorders. Table 5 describes the various investigations in detail.

Community management

Most presentations of dysphagia are secondary to reflux.[30] First-line treatments can be instituted with an empiric prescription of proton pump inhibitors and liquid antacids for at least eight weeks.[31,32] GPs should counsel the patient on lifestyle modifications such as head elevation during sleep, avoidance of late-night meals, and avoiding exacerbating foods.[33] Not only does tobacco smoking cause laryngopharyngeal irritation, it leads to many aetiologies of dysphagia and therefore cessation counselling should be provided. In patients without any red flags, a referral to a specialist should be made when the dysphagia persists.

There is a significant burden of disability related to chronic dysphagia and the

Table 4. Key elements in the physical examination for dysphagia

General inspection	• Sarcopenia • Tobacco-stained fingers or Raynaud's phenomenon (indicating scleroderma) • Jaundice • Vital signs • Surgical scars and neck masses • Gait abnormality • Facial tone and symmetry • Ptyliasim/drooling/inability to tolerate secretions • Quality of voice (eg wet, hoarse, hot potato)
Oral cavity	• Assessment of trismus, dental occlusion, temporomandibular joint and trismus • Tongue • Deviation, fasciculations, thrush, tongue and base of tongue palpation • Soft and hard palate, gingiva, buccal surfaces and floor of mouth • Symmetry, ulcers, lesions, bleeding sites, dental hygiene and thrush • Tonsils and tonsillar fossa – Comment on size (Brodsky grading scale) and symmetry
Neck	• Range of neck motion and assessment of torticollis • Palpation of cervical and supraclavicular lymph nodes (Virchow's node) • Palpation of thyroid gland
Abdomen	• Palpate for abdominal masses • Gastrostomy tube • Hepatosplenomegaly
Neurological examination	• Cranial nerves – Specifically V, VII, IX, X, XI and XII • Unilateral or focal weakness
Swallow assessment	• Water sip test and assessing for oral spillage, choking or coughing

associated risks of aspiration, malnutrition and dehydration. Speech pathologists can provide education on postural techniques and dynamic manoeuvres to protect the airway during ingestion, while also altering food consistencies appropriate to the degree of dysfunction.[34] Oral hygiene maintenance reduces the colonisation of gastric microbes in the oropharynx and can reduce the risk of aspiration pneumonia in vulnerable patients.[1,35] This can be ensured by educating patients on the importance of routine dental hygiene and review. Referral to a dietitian can help with maintaining appropriate caloric and fluid requirements, which need to be tailored around dietary restrictions. In addition to these risks, chronic dysphagia can also have significant social and psychological ramifications due to the inability to enjoy eating, as well as the lack of participation in social dining, and attention should be directed towards these emotions.[2] Overall, given the holistic implications of the disability, it is important that any counselling and management also involve families and carers.[36,37]

In severe cases of chronic dysphagia, enteral feeding may be considered. Families should be counselled about the harms and limited benefits of long-term enteral feeding with a nasogastric or percutaneous gastrostomy tube, especially in those with advanced dementia.[38]

Conclusion

Dysphagia is a challenging complaint to manage. The aetiologies are broad and complex and as such, patients need a multifaceted approach. These patients would benefit from the integration of speech pathologists, dietitians and primary and tertiary care specialists. This article provides primary physicians with a guided template of pathologies and investigations that might help narrow the diagnosis.

Key points

- The prevalence of adult-onset dysphagia in Australia will continue to rise with a rapidly growing ageing population.
- Chronic dysphagia is common in the geriatric population and is a serious risk factor for the development of aspiration pneumonia.
- A thorough work-up allows the GP to delineate between oropharyngeal and oesophageal dysphagia and proceed with the relevant referral to either a gastroenterologist or an ENT specialist.
- Red flags for urgent specialist referrals include history of head and neck malignancy, history of heavy alcohol or tobacco use, new onset of persistent hoarseness, unexplained weight loss, haemoptysis and haematemesis, otalgia, unrelenting pain and obstructive dysphagia.
- Incorporating allied health professionals such as speech pathologists, dietitians, nurses and carers into dysphagia treatment is vital to setting up safe-feeding measures.

Authors

Fred Chuang MD, MBS, Principal House Officer, Department of Ear Nose and Throat, The Royal Brisbane and Women's Hospital, Brisbane, Qld

Rohan Arasu MBBS, Service Registrar, Department of Vascular Surgery, The Fiona Stanley Hospital, Murdoch, WA

Gavin Quail MBBCH, MMed, FCORL, Ear Nose and Throat Surgeon, Department of Ear Nose and Throat, Cairns Base Hospital, Cairns, Qld

Stephen Johnston FACRRM, MBBS, JCCA, Rural Generalist Specialist with an Ear Nose and Throat Special Interest, Torres and Cape York Hospital Health Service, Cairns, Qld

Table 5. Imaging and investigative modalities

Investigation	Indication
Barium swallow	• This type of imaging can inform the clinician of the level of pathology and assist in assessing for dysmotility and obstructive and diverticular pathologies
Modified barium swallow study/ VFSS	• This study is performed by a speech pathologist and radiologist and focuses on the swallowing of foods and fluids of varying consistencies up to the level of the upper oesophageal sphincter
FEES	• A FEES is performed by a speech pathologist with a flexible nasoendoscopy to directly visualise the larynx during the swallowing of foods/fluids of various textures
MRI	• An MRI assists in staging and characterising H&N lesions by providing information such as depth of invasion, associated structural invasion and lymphadenopathy
CT of the head, neck and chest	• A CT scan is a useful initial imaging tool to assess for any H&N or oesophageal mass and identify any lymphadenopathy
Ultrasound	• An ultrasound might assist in identifying neck lymphadenopathy and glandular pathologies and characterising thyroid masses • A radiologist will often provide recommendations for further fine needle aspiration
Flexible nasoendoscopy	• This is performed by an ENT specialist under topical local anaesthesia to assess the pharynx and larynx and to perform an in-clinic biopsy
Upper endoscopy	• An upper endoscopy allows the proceduralist to perform a biopsy, dilatation of a stricture, steroid infiltration or a foreign body retrieval
Manometry	• A manometry assessment assesses the contractility of the oesophageal sphincter • Contraction pressures with a catheter probe can map the type and location of dysmotility

CT, computed tomography; ENT, ear–nose–throat; FEES, flexible endoscopic evaluation of swallow; H&N, head and neck; MRI, magnetic resonance imaging; VFSS, video fluoroscopic swallow study.

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Correspondence to:
fred_ch@live.com

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correspondence **ajgp@racgp.org.au**

Pelvic congestion syndrome:
Not all pelvic pain is gynaecological

Joseph Hanna, Joshua Bruinsma, Mitchell Barns, Mark Hanna, Basim Boulos, Stefan Ponosh

Background
Chronic pelvic pain is a debilitating but common syndrome that is a burden both for patients and health systems. Pelvic congestion syndrome (PCS) contributes to 30–40% of patients presenting with chronic pelvic pain where no other cause is identified. However, PCS is poorly understood, underdiagnosed and undertreated, with the average time to diagnosis being reported as up to four years after initial presentation.

Objective
This article describes the pathophysiology of PCS and outlines the symptomatology, the most efficient diagnostic pathway and the optimal treatment methods for practitioners encountering patients presenting with PCS.

Discussion
The aetiology of PCS is multifactorial and it is thought to be caused by both hormonal and anatomical dysfunction. Patients with PCS present with a cluster of symptoms related to pelvic venous congestion, including pelvic pain worse on standing, irritable bowel symptoms, dyspareunia, vulval varicosities and lower limb venous pathology. Transvaginal ultrasound is a non-invasive and sensitive test for PCS. Ovarian vein embolisation is a safe, minimally invasive and efficacious treatment for PCS.

CHRONIC PELVIC PAIN (CPP), defined as pain perceived to originate from the pelvis lasting more than six months, is a debilitating but common condition affecting 26% of women worldwide.[1,2] It also poses a significant economic burden on health systems as CPP accounts for approximately 20% of all gynaecology outpatient appointments and up to 40% of gynaecological laparoscopies.[3,4] CPP is a challenging and often multifactorial clinical syndrome, with multiple possible differential diagnoses. In patients with CPP for which no alternate cause can be identified, studies have suggested that pelvic congestion syndrome (PCS) can have a prevalence of 30–40%.[5,6] This prevalence might be underestimated due to poor awareness of PCS as an aetiology for CPP, no standardised diagnostic criteria and a lack of recent high-quality research in the area.

PCS consists of a group of clinical symptoms associated with pelvic venous insufficiency – usually reflux of the ovarian or internal iliac veins.[6] PCS has a substantial effect on patients, clinicians and health networks. However, it is a disease entity that is still poorly understood, underdiagnosed and, therefore, undertreated, with the average time to diagnosis being reported as up to four years after initial presentation.[7]

Aim

PCS poses a diagnostic challenge to general practitioners (GPs) and gynaecologists in the differential diagnosis of patients presenting with CPP. This review explores the pathophysiology, symptomatology, investigation and treatment of PCS.

Pathophysiology of PCS

The female pelvic viscera are drained by a rich anastomotic plexus of veins, including ovarian, para-ovarian, uterine, vesicular, rectal and vulvar veins. These channels predominantly rely on vascular tone and gravity for drainage and are relatively valveless.[8] In PCS, these vessels, particularly the ovarian veins, are incompetent and enlarged, with stagnation or reflux of blood flow as demonstrated schematically in Figure 1. This incompetence results in pelvic venous hypertension and dilated congested pelvic varicosities involving the uterus, rectum, bladder and vagina. The aetiology of these changes is poorly understood but is hypothesised to be secondary to both hormonal and anatomic dysfunction, which are particularly exaggerated during pregnancy.[9] The vasodilatory effects of oestrogen and progesterone are thought to contribute to ovarian venous dilatation and PCS.[10] Further, pregnancy is associated with a 60% increase in the capacity of the pelvic veins and venous kinking associated with the malpositioned gravid uterus. These changes are thought to persist upon the completion of the pregnancy, with the pelvic veins failing to return to normal size and function.[8] To support these theories, PCS has been found to most commonly affect women of reproductive age (between 20 and 45 years), with parity being a well-established risk factor.[11,12] It is increasingly accepted that it can occur in younger nulliparous women and is associated with congenital venous abnormalities.[13] Rarely, pelvic venous hypertension can be associated with extrinsic venous compression such

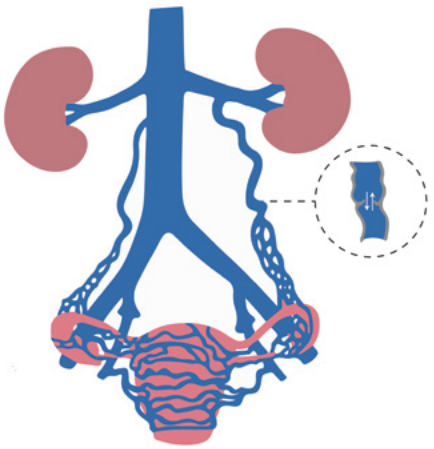

Figure 1. Schematic illustration representing ovarian and internal iliac vein reflux leading to pelvic varicosities.

Adapted from Liang E. Pelvic congestion syndrome. Sydney Fibroid Clinic, 2019. Available at www.sydneyfibroidclinic.com.au/pelvic-congestion/about-pelvic-congestion, with permission from Liang E.

as May-Thurner syndrome (iliac vein compression between the iliac artery and the spine) or nutcracker syndrome (renal vein compression between the aorta and the superior mesenteric artery).[14]

Clinical evaluation

The characteristic pain is perceived to originate from pelvic organs/structures, can be cyclical or non-cyclical, and typically lasts longer than six months. Pelvic pain that is venous in origin is typically felt as a dull ache/heaviness and can be unilateral or bilateral. Symptoms are often worse with walking and prolonged standing and during and after coitus.[15,16] Irritable bowel symptoms, bloating, dyspareunia, vulval varicosities and lower limb venous pathologies are commonly associated with PCS. High clinical suspicion should be raised with ongoing pelvic symptoms in patients when other gynaecological pathology has been optimised or ruled out. On clinical examination, patients often have lower abdominal, adnexal tenderness on bimanual examination and might have visible vulvovaginal, gluteal, perineal or lower limb varices. Table 1 outlines possible pathologies to consider when evaluating a patient with CPP.

Investigation

Imaging is a critical part of the work-up of patients with suspected PCS to characterise pelvic venous changes. Ultrasound assessment is considered a first-line investigation as it is non-invasive and inexpensive and does not expose the patient to radiation. Ultrasound can be performed through transabdominal and transvaginal approaches. Transabdominal ultrasound can demonstrate pelvic varicosities and enable accurate examination of the left ovarian vein. The transvaginal approach, however, is considered the examination method of choice, as it enables a more accurate examination of the pelvic venous plexus compared to the transabdominal approach.[12] Both techniques can be combined with Doppler imaging and provocation manoeuvres such as Valsalva, tablet tilt or standing examinations to look for retrograde flow or flow reversal suggestive of reflux.[17] It is important to note that Doppler examination of the ovarian and pelvic veins is not routinely included in a standard pelvic ultrasound and should be specifically requested by clinicians who suspect a diagnosis of PCS.

Computed tomography (CT) and magnetic resonance venography (MRV) are also widely used in the work-up of CPP and can show vein diameter and the presence of pelvic varices. Both modalities can also provide a detailed anatomical overview and rule out other pathologies. A 2018 systematic review by Steenbeek et al suggested that MRV was as effective as ultrasonography in diagnosing PCS. However, due to only a small number of heterogenous studies available in the literature, they were unable to draw a firm conclusion.[18] A small retrospective study showed that CT and MRV were equivalent; however, there is no high-quality evidence to support this finding.[19] Both CT and MRV are also performed in the supine position, which might result in underdiagnosis of PCS in the early phases, as there is less venous engorgement compared to ultrasonography, which can be performed in dynamic positions.[18] Another consideration is that CT imaging requires radiation and should generally be avoided in this cohort of patients who are often premenopausal.[16]

Catheter-directed venography of the ovarian and internal iliac veins remains the reference standard for the diagnosis of pelvic venous pathology. It has all the aforementioned benefits of allowing provocation manoeuvres and assessing retrograde flow and demonstrates filling of contralateral veins or reflux in tributaries. However, venography is costly and invasive and is not commonly performed as a first-line investigation.

Although demonstration of ovarian vein dilation on imaging might suggest PCS as the aetiology driving a patient's CPP, a 2010 systematic review suggested that these findings can be found in asymptomatic patients or those with an alternate cause for pelvic pain, which only contributes to the diagnostic difficulties.[20]

Table 1. Differential diagnoses of chronic pelvic pain

Gynaecological	Urologic	Gastrointestinal
• Endometriosis	• Interstitial cystitis	• Irritable bowel syndrome
• Leiomyoma	• Radiation cystitis	• Inflammatory bowel disease
• Adenomyosis	• Bladder cancer	• Colorectal carcinoma
• Ovarian remnant syndrome		
• Pelvic inflammatory disease		

Musculoskeletal	Neurological	Vascular
• Abdominal wall myofascial pain	• Abdominal wall cutaneous nerve entrapment	• Pelvic congestion syndrome
• Pelvic floor tension myalgia	• Central sensitisation	
• Fibromyalgia		
• Coccygodynia		

Treatment

There is a sparsity of up-to-date, high-quality literature to guide clinicians in the treatment of PCS. The available evidence, however, describes several therapeutic options that have been shown to successfully alleviate pain in patients suffering from PCS, including medical, surgical and endovascular therapies, which are summarised in Table 2.

Medical treatment of PCS can involve symptomatic, hormonal or venoactive therapy. Of note, medroxyprogesterone acetate (MPA) and gonadotropin-releasing hormone (GnRH) agonists such as goserelin have been used to suppress ovarian function and increase venous contraction. However, the effects of these drugs are often short-lived and they are not efficacious in the long term.[21]

Surgical ligation of the ovarian veins, either through an open retroperitoneal or laparoscopic approach, was also historically performed for primary ovarian vein incompetence with varying results. However, this procedure is performed with the patient supine, with the patient's abdomen insufflated with pressurised carbon dioxide, which might result in the underestimation of the number of varices and, therefore, decrease procedural efficacy.[22] Further, this procedure exposes the patient to a general anaesthetic and a long recovery period and, therefore, is no longer commonly performed.

Ovarian vein embolisation (OVE) is an endovascular procedure that is performed in a catheterisation laboratory or interventional suite and has emerged as the preferred gold standard treatment for PCS. It is performed under local anaesthetic with or without sedation and can be safely performed in an ambulatory vein clinic.[23] The procedure involves venous access, usually into the common femoral vein followed by diagnostic venography to characterise and identify insufficient venous axes, which are subsequently embolised and occluded using platinum coils or sclerotherapy. An example of reflux of the right ovarian vein is shown in Figure 2A and coil embolisation in Figure 2B. Patients are discharged on the day of the procedure. Reported complications range from 0.85% to 10% and are usually minor without sequelae. These include access-site haematoma, contrast reaction, coil migration (managed with snaring during the same procedure) and embolisation of a non-target vein (which can usually be retrieved during the same procedure). Although there is a paucity of randomised studies comparing embolisation to placebo, the technical success rate of OVE in large cohort studies has demonstrated a high technical success rate of 98–100%, with symptom improvement at one to five years of follow-up in 80–93% of patients.[16,24–27] Furthermore, a 2003 randomised control trial by Chung and Huh demonstrated embolotherapy as significantly more effective at reducing pelvic pain compared to medical therapy and hysterectomy.[24]

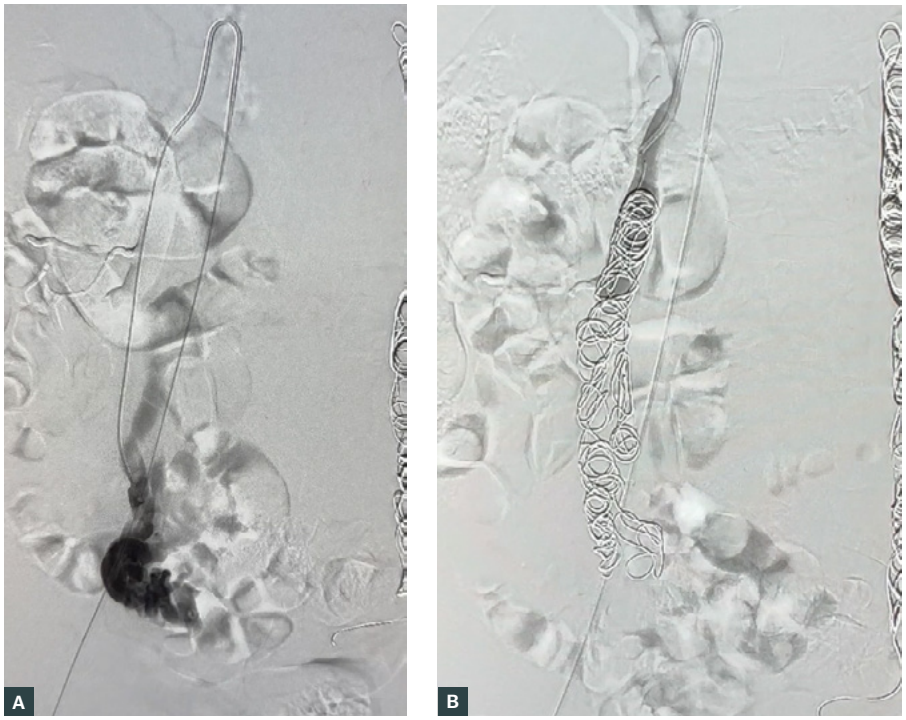

Figure 2. (**A**) Venography of the right ovarian vein, showing reflux and pooling of contrast in the pelvic veins and (**B**) venography after coiling of the right ovarian vein, showing occlusion of the vein and no further pooling of contrast.

Conclusion

This clinical summary highlights the key aspects of PCS, a condition often overlooked but associated with significant morbidity in women. PCS manifests as CPP, which can greatly affect a patient's quality of life. This summary emphasises the importance of considering PCS as a potential diagnosis in women with refractory CPP and highlights the various diagnostic modalities available, including imaging techniques and minimally invasive procedures, which can aid in confirming the presence of pelvic venous insufficiency. Further, this summary provides an overview of the treatment options, ranging from conservative measures to endovascular interventions, which aim to alleviate symptoms and improve patient outcomes. By increasing awareness and understanding of PCS among healthcare professionals, this clinical summary promotes early recognition and appropriate management of this potentially underdiagnosed condition, ultimately improving patient care and enhancing their quality of life.

Key points

- CPP is a common but challenging presentation for GPs and gynaecologists.
- PCS contributes to 30–40% of CPP where no other cause is found but is not considered and therefore might be underdiagnosed.
- PCS can be relatively easily diagnosed with transvaginal ultrasound.

Table 2. Summary of treatment methods for pelvic congestion syndrome

Treatment	Examples
Medical	
Symptomatic therapy	Simple analgesia Gabapentin/amitriptyline
Hormonal therapy	Medroxyprogesterone acetate Gonadotropin-releasing hormone agonist
Venoactive therapy	Micronised purified flavonoid fraction
Surgical	Open retroperitoneal ovarian vein ligation Laparoscopic ovarian vein ligation Hysterectomy with salpingo-oophorectomy
Endovascular	Ovarian vein embolisation

- Ovarian vein embolisation is a safe, minimally invasive and efficacious treatment of PCS.
- Better awareness and clinical suspicion for the symptomatology of PCS might speed up diagnosis and treatment.

Authors

Joseph Hanna MD, MS, Surgical Registrar, Department of Vascular Surgery, Joondalup Health Campus, Perth, WA; Surgical Registrar, Hollywood Private Hospital, Perth, WA

Joshua Bruinsma MD, MS, BSc, Surgical Registrar, St John of God Subiaco Hospital, Perth, WA

Mitchell Barns MD, MSc, BSc (Hons), Surgical Registrar, Department of Urology, Sir Charles Gairdner Hospital, Perth, WA

Mark Hanna BCom, MPE, School of Medicine, University of Notre Dame Fremantle, Perth, WA

Basim Boulos BA, MArch, Adjunct Lecturer, School of Architecture, University of Western Australia, Perth, WA; Architect, Grotto Studio, Perth, WA

Stefan Ponosh MBBS (Hons), FRACS (Vasc), Vascular Surgeon, Department of Vascular Surgery, Hollywood Private Hospital, Perth, WA; Vascular Surgeon, Ponosh Vascular, Perth, WA

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Correspondence to:
joeyhanna2@gmail.com

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Chemical eye injury in remote and urgent care clinic settings

Lawrence Kwok, Andrew Burbidge

Background
Chemical eye injuries are potentially sight-threatening injuries, representing 10–22% of all ocular trauma presentations. Prompt assessment and management of chemical eye injuries in general practice and urgent care clinic settings can prevent patients from losing vision.

Objective
This article presents a clinically useful guide for general practitioners to support the primary management of chemical-related eye injuries, particularly in rural and regional settings. This article will first discuss the variety of chemical eye irritants found in domestic and commercial settings. It will then describe the steps for assessment of chemical-related eye injuries, methods for irrigation and post-irrigation management.

Discussion
Among chemical eye injuries occurring in rural areas, cleaning agents are the most common cause, followed by injuries from personal products, industrial agents, pesticides and herbicides, and petroleum-based products. General practitioners should conduct an initial assessment and instigate immediate management of chemical eye injuries. Advice about the pH level of substances can be obtained from the Poisons Information Centre. Chemical eye injuries coinciding with an epithelial defect or decreased vision should be reviewed by an ophthalmologist within 24 hours of the initial injury.

CHEMICAL EYE injuries are potentially sight threatening. They are uncommon in general practice and present more frequently in rural and regional emergency and urgent care clinic settings.[1] They represent 10–22% of all ocular trauma presentations.[2] Chemical eye injuries represent three in 100 eye injury encounters in general practice.[3] Understandably, primary care practitioners might feel less well prepared to deal with ophthalmic emergencies, particularly chemical eye injuries in rural settings.

A study of 1480 patients who called the Victorian Poisons Information Centre between January 2009 and January 2010 found that among the caustic substances individuals were exposed to, cleaning agents were the most common cause of eye injuries (comprising 32.6% of exposures), followed by personal products (haircare/shampoo; 25.4%), industrial agents (11.8%), pesticides and herbicides (5.7%) and petroleum-based products (4.2%).[4] Men sustained industrial agent injuries more commonly than women: 74.8% versus 25.2%.

Primary healthcare providers might not be confident in the assessment and management of ocular injuries due to the infrequent presentation of injuries and lack of training. However, understanding the pathophysiology of the injury and steps for prompt management of a chemical eye injury can prevent the patient from losing vision. The aim of this article is to present a clinically useful guide for general practitioners and urgent care physicians so they feel better equipped in the primary management of chemical-related eye injuries, particularly in rural and regional areas.

Chemical eye irritants

Ocular chemical burns can be categorised as acidic or alkali. Alkali substances tend to have more propensity for injury, as they promote cell membrane lysis and penetrate the cornea deeper, causing denaturation of proteins, fat saponification and liquefactive necrosis, with stromal fibroblast necrosis limiting the repair of denatured stromal collage.[5] Alkali substances also penetrate other tissues deeper than acidic substances, including the conjunctiva and skin. Common alkali substances, such as ammonia, can be found in cleaning solutions and nitrogen-based fertilisers; drain cleaners contain sodium hydroxide; and calcium hydroxide is present in plaster and cement (Table 1).

For acidic substances, coagulation necrosis occurs where the burned and denatured proteins form an eschar, and consequently, a natural barrier is created from advancement of the offending substance. This is why an eye injury from acidic substances is likely to be superficial compared to an injury from alkali substances, which can penetrate much deeper. Common acidic substances can be found in car batteries, swimming pool disinfectants, dyes and vinegars.[6]

Initial assessment

Ingestion or inhalation of the caustic substance might trigger prompt resuscitation of the patient, as the airway might be threatened from laryngeal oedema. Ensure prompt treatment for any patient with compromised vital signs. Transferring the patient to a general hospital should be considered if multiple body systems are affected (eg skin and respiratory systems).

Table 1. Common chemical eye irritants

Acids		
Acid	**Example**	**pH**
• Hydrochloric acid	• HCl 0.1 (1.0 N solution)	0.01
• Sulphuric acid	• Acid in car batteries	1
• Acetic acid	• Vinegar, lemon juice	2
• Phosphoric acid	• 'Fizzy drink' (eg cola)	2.6–2.7
• Hypochlorous acid	• Pool disinfectant	2.8–7.5
• Hydrofluoric acid	• Rust removers and metal cleaners	3
• Nitric acid	• Dyes	3
• Boric/phosphoric acid	• Pesticides	5–7
Alkalis		
Base	**Example**	**pH**
• Calcium hydroxide	• Plaster and cement, lime	11–12.5
• Sodium hypochlorite	• Chlorine bleach, pool disinfectant	11–13
• Ammonia products	• Nitrogen-based fertilisers	11–13
• Sodium hydroxide	• Caustic soda oven cleaner and drain cleaner and lye	14

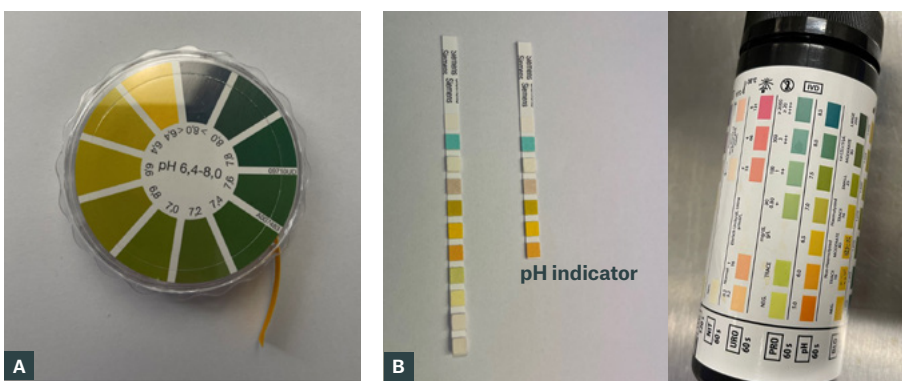

Figure 1. (**A**) Universal pH indicator strips. Colour change after strip applied to fornix compared to references provided. (**B**) Urinalysis test strips can be cut down to the pH indicator square to apply the conjunctival fornix and compare against reference values.

Irrigation and pH testing

Once a chemical eye injury has been established, irrigation of the eye should commence immediately. You can never irrigate the eye too much. If a chemical injury is suspected, the clinician should commence irrigation simultaneously with history-taking if necessary. Ideally, pH testing should be performed in both eyes prior to irrigation. If only one eye is affected, the other eye can serve as a reference point when testing for a normal pH level. To test the ocular pH, apply a pH indicator strip to the conjunctival fornix (Figure 1).

If a universal pH indicator strip is not available, a urinalysis strip can be used. The strip will need to be cut down so the pH reading area can be applied directly to the conjunctival fornix (Figure 1). Note that the pH value from the urinalysis strip ranges from 5 to 9 rather than 1 to 10 for the conventional pH strips.

After the materials are gathered (Figure 2), instil a drop of topical anaesthetic into the eye in the form of tetracaine or oxybuprocaine. Irrigate the eye until one litre of a fluid bag has been emptied. Wait for five minutes after cessation of irrigation and check the pH level of the eye again. If a physiologic pH of 7.0 to 7.4 has not been reached, further irrigation with another litre of fluid should occur. For strong acidic or basic substances, irrigation for up to two hours might be necessary. Irrigation should commence with what is currently at the clinician's disposal. If only tap water is currently available, irrigation under a sink would suffice until the proper materials are sourced. Allow for the water to run from the bridge of the nose towards the ear to ensure that the caustic substance does not affect the other eye.

Any form of intravenous fluid can be used for irrigation (eg Hartmann's and normal saline), but a warmed solution as opposed to that at room temperature is more tolerable for patients.[7]

A Morgan lens is ideal for continuous ocular irrigation as it is well tolerated by patients (Figure 2). The Morgan lens is placed directly onto the eyes with fluids connected to its port. A Y-connector should be in place with the line primed for another infusion bag to ensure that the irrigation does not stop.

Nasal prongs can be used if a Morgan lens is not available.[8] By positioning the nasal prongs over the bridge of the nose, the irrigation will run down into the eyes. Nasal prongs can be connected to an intravenous fluid bag via a plastic sump connector (Figure 3).

To provide time-sensitive irrigation, especially in the setting of an urgent care clinic, it might be necessary to pre-organise a 'chemical eye injury pack' that incorporates all necessary materials for a presentation (Figure 2). It might also be prudent to have an 'eye assessment pack' ready for post-irrigation management. The items necessary in such a pack would include topical anaesthetic, fluorescein strips, eye pads, a binocular magnifier, a Wood's lamp, a pinhole occluder and micropore tape.

Figure 2. Chemical eye injury emergency box equipment, including (**A**) 2 1-L bags of normal saline; (**B**) 2 giving sets; (**C**) varying sized syringes (**D**) pH testing strips; (**E**) 2 Morgan lenses; (**F**) 10-mL saline ampoules; (**G**) cotton buds; and (**H**) gauze and towels.

Table 2. Roper-Hall classification for ocular surface burns[9]

Grade	Prognosis	Cornea	Limbus
I	Good	Corneal epithelial damage	No limbal ischaemia
II	Good	Corneal haze, iris details visible	<1/3 limbal ischaemia
III	Guarded	Stromal haze, iris details obscured	1/3 to 1/2 limbal ischaemia
IV	Poor	Cornea opaque, iris and pupil obscured	>1/2 limbal ischaemia

Post-irrigation management

After irrigation is complete and pH has normalised, a thorough ocular assessment should be performed. Visual acuity should be assessed using a Snellen visual acuity chart to assess the degree of impairment. There would be an expected degree of decrease in acuity given the microtrauma caused by irrigation. However, a patient with a visual acuity of counting figures would warrant further concern compared to a patient who can read small letters. The eyelid and eyelash margins should be examined. The eyelids should be everted to ensure there is no trapped particulate material in the superior and inferior fornices.

The cornea and conjunctival surface should be examined with fluorescein staining. The deeper layer of the cornea includes the stroma, and the degree of cornea haze should be noted as this predicts visual prognosis.

Damage to the limbus is crucial to note as this can provide information on visual recovery. As the limbal region houses the epithelial stem cells, any form of ischaemia will affect corneal regeneration following damage. The appearance of a pale and blanched limbus (the interface of the cornea and conjunctiva) represents limbal ischaemia.

The Roper-Hall classification can be used to classify chemical eye injuries (Table 2).[9] It grades chemical injuries based on the clarity of the cornea and degree of limbal ischemia. Since 2020, the newer Dua classification has been used to grade chemical injuries based on limbal and conjunctival involvement (Table 3).[10]

After completion of irrigation, further pharmacological therapies can be considered.

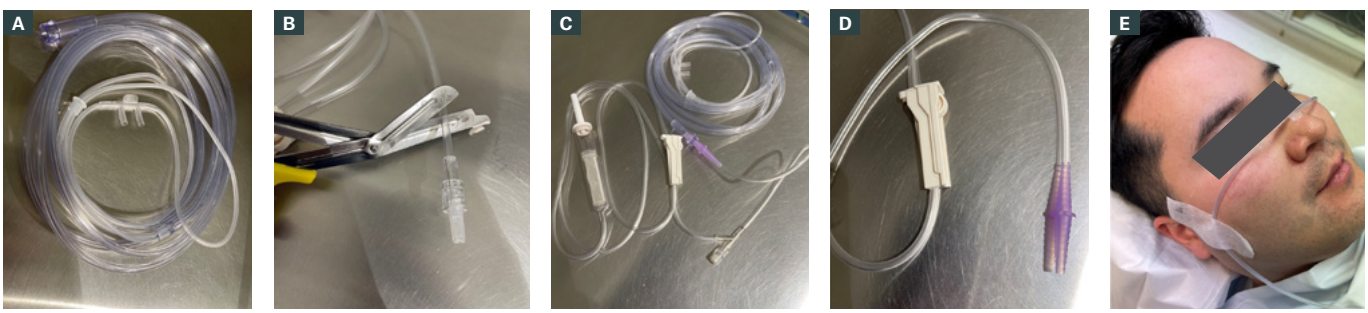

Figure 3. (**A–D**) The nasal prong connection is removed and replaced with a plastic sump connector. The other end of the connector is attached to an infusion line connected to an irrigation bag. (**E**) The nasal prongs are placed over the bridge of the nose and the tubing is taped to the side of the face.

Table 3. Dua classification for ocular surface burns[10]

Grade	Prognosis	Limbal involvement (clock hours)	Conjunctival involvement (%)	Analogue scale[A] (%)
I	Very good	0	0	0
II	Good	<3	<30	0.1–3/1–30
III	Good	>3–6	>30–50	3/1–6/30.1–50
IV	Good to guarded	>6–9	>50–75	6.1–9/51–75
V	Guarded to poor	>9–<12	>75–<100	9.1–11/75.1–99.9
VI	Very poor	12 (total limbus)	100 (total conjunctiva)	12/100

[A]The analogue scale records the amount of limbal involvement in clock hours of affected limbus/percentage of conjunctival involvement. The conjunctival involvement should be calculated only for the bulbar conjunctiva, up to and including the conjunctival fornices.

For all grades of injury, regular oral analgesia should be prescribed. For grade I and II injuries according to Roper-Hall classification, chloramphenicol qid can be used as well as a topical steroid to reduce inflammation (eg fluorometholone or Prednefrin Forte qid).

For more severe injuries, an ophthalmologist should be consulted. Topical chloramphenicol qid and fluorometholone/Prednefrin Forte qh can be considered. In cases of pain due to ciliary spasm and photophobia, topical cyclopentolate 1% or atropine 1% tds can be used. Topical ascorbic acid 10% can be used every 1–2 hours to replenish lost collagen. Systemic ascorbic acid (vitamin C) 500 mg qid can be used to promote collagen synthesis and for pain relief.

Conclusion

Primary care practitioners should feel supported to confidently conduct an initial assessment and instigate immediate management of chemical eye injuries. If additional advice is required, further help can be obtained from locally based optometrists or ophthalmologists. Additional advice can be obtained by calling the Poisons Information Centre if unsure about the pH level of a substance. Ideally, chemical eye injuries associated with an epithelial defect or decreased vision should be reviewed by an ophthalmologist within 24 hours of the initial injury.

Authors

Lawrence Kwok BSc (Hons), MD, MMed (Ophth Sci), Senior Resident Medical Office, Sydney Hospital and Sydney Eye Hospital, Sydney, NSW

Andrew Burbidge BMedRadSci (DR), BMed, MMed (Ophth Sci), FRACGP, Ophthalmology Registrar, Royal Victorian Eye and Ear Hospital, Melbourne, Vic; Ophthalmology Registrar, The Royal Children's Hospital, Department of Ophthalmology, Melbourne, Vic; Conjoint Fellow, School of Medicine, University of Newcastle, Newcastle, NSW

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Correspondence to:
lawr.kwok@gmail.com

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correspondence **ajgp@racgp.org.au**

A primary care approach to the discharging ear

Raymond Li, Kristy Fraser-Kirk

Background
Otorrhoea is a common presentation in both primary care and emergency settings, with a broad range of differential diagnoses that can make accurate assessment and management challenging for the primary care practitioner.

Objective
This article describes a systematic approach to the assessment of otorrhoea, outlines common causes and their first principles of management in the primary care setting, and provides recommendations for when specialist referral is indicated.

Discussion
A clear clinical assessment and targeted investigations are essential in the identification and initial management of otorrhoea. Many causes of a discharging ear can be managed in the primary care setting; however, it is also important to recognise circumstances in which escalation is required to a specialist otolaryngology service.

THE DISCHARGING ear is a common primary care ear, nose and throat (ENT) presenting complaint and might represent a wide variety of underlying diagnoses. A targeted approach is essential in differentiating benign disease from that which might warrant specialist referral. This article reviews common causes of otorrhoea, their different features, and principles in assessment and management for the primary practitioner.

Anatomy of the ear

The ear can be broadly considered in three anatomical compartments: the external, middle and inner ear.[1]

The external ear consists of the pinna and the external auditory canal (EAC) up to the tympanic membrane (TM). The EAC is lined by keratinised stratified squamous epithelium and produces keratinaceous debris and cerumen (earwax).[1–5] The middle ear exists behind the TM, housing the malleus, incus and stapes, and has an important role in mucociliary clearance into the nasopharynx via the Eustachian tube.[1,6] The middle ear is mostly comprised of non-keratinised squamous epithelium, sharing similar features to respiratory epithelium.[6] The inner ear is the most medial compartment, consisting of the cochlea and vestibular apparatus, including the vestibular organs (utricle and saccule) and semicircular canals.[1]

Assessment

History

A clear history is essential when assessing undifferentiated otorrhoea. Duration of symptoms can be acute (less than six weeks) or chronic (more than six weeks). Patients should be asked about the colour, texture, frequency and pattern of otorrhoea. Preceding events should be enquired about, including water exposure, trauma or upper respiratory illness. A history of previous ENT conditions should be clearly elucidated in addition to any required medical or surgical intervention. Presence of otalgia, hearing loss and vertigo can help localise the anatomic area of disease. Meningism, facial weakness or cranial nerve dysfunction are red flags that should prompt urgent specialist discussion.

Examination

Aural examination should begin with inspection of the ear for any pinna swelling, deformity or periauricular change, followed by palpation of bony and cartilaginous structures.[7] A pinna pull is non-specific but particularly tender in acute otitis externa (OE). Periauricular nodes might also be palpable and tender in patients with OE.

A systematic otoscopic examination should follow. Canal patency, quality of canal mucosa and presence of debris should be noted. Dry mopping with a swab or tissue spear can help clear debris for better examination.[7] The TM and middle ear should be assessed for perforation, bulge or retraction. A Valsalva manoeuvre helps assess drum mobility and localises small perforations by encouraging passage of middle ear fluid.[5] Microsuction is both a useful diagnostic and therapeutic adjunct that helps in examining the canal and drum under direct vision in equipped clinics.[7]

Cranial nerves should be assessed for all patients suspicious for infective or intracranial complications. Facial nerve function, in particular, should be assessed

given its course through the middle ear. The appearance and distribution of vesicles in and external to the canal should be noted and, in conjunction with the presence of any facial symptoms, might suggest the presence of a herpes zoster infection.

Investigations

Swab microscopy, culture and sensitivities

Swabs should be considered to determine relevant organisms and guide appropriate antimicrobial treatment for infective otorrhoea. Common bacteria implicated in OE include *Staphylococcus aureus* and *Pseudomonas aeruginosa*.[5] Otorrhoea of middle ear origin might involve *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis* and other respiratory organisms.[6] Common fungi include *Aspergillus* and *Candida* species.[5]

Audiogram

For patients with reduced hearing, audiometry can help localise the compartment of disease and monitor progress. Pure tone audiometry helps delineate conductive and sensorineural hearing loss and is best interpreted with tympanometry to assess middle ear function, compliance and TM mobility.

Imaging

Radiologic assessment should be considered in primary care for otorrhoea refractory to first-line management with hearing loss or other concerning features. Computed tomography (CT) can be performed to evaluate the bony architecture of the temporal bone. Middle ear opacification suggests the existence of fluid or soft tissue and might indicate the presence of otitis media or cholesteatoma.

Magnetic resonance imaging (MRI) might be considered in patients with suspected cerebrospinal fluid (CSF) leakage[8,9] or malignant OE but might need to be escalated to an ENT specialist.

Common causes of otorrhoea

Cerumen

Cerumen production is a physiological process that provides barrier protection and lubricates the EAC. Cerumen is also responsible for trapping and expelling debris from the ear through epithelial migration and jaw movement.[3] Texture and consistency can vary depending on individual, genetic and environment factors. Treatment typically involves over-the-counter cerumenolytics and aural toilet.[4] Syringing can be performed but is not recommended in patients with TM perforations due to the risk of OE and potential severe middle ear damage.[3,4]

Otitis externa

OE refers to inflammation of the external ear and presents with debris, canal oedema and pain exacerbated by ear manipulation.[2] OE is commonly bacterial, involving *S. aureus* and *P. aeruginosa*, with mucopurulent otorrhoea. Fungal organisms include *Aspergillus* and *Candida* species and might exhibit cottage cheese-like debris, hyphae or spores on examination. Treatment involves antimicrobial drops, with dry mopping or microsuction if available. Significant canal stenosis might require an ear wick to facilitate medication delivery. Ciprofloxacin-based drops combined with steroid are safe, not ototoxic and recommended for bacterial infections when TM perforation cannot be ruled out. Clotrimazole and Otocomb Otic are effective antifungal preparations but have unclear ototoxicity and are not broadly recommended for perforations. A short course of oral corticosteroids might have a role in reducing pain and swelling in patients with severe OE, with a study by Balch et al demonstrating a reduction in duration of symptom severity but no significant difference in the duration of disease.[10] Clinicians should also be wary of immunosuppressed patients with OE and severe otalgia. These patients might require CT imaging to evaluate for malignant OE (skull-base osteomyelitis).[5]

Acute otitis media with perforation

Acute otitis media (AOM) is an infection of the middle ear and presents with recurrent pain, hearing loss and perforation.[11] AOM with otorrhoea implies a perforated eardrum and might be mucopurulent or bloodstained. AOM is usually self-limiting and should resolve with supportive care and analgesia; however, short courses of oral antibiotics should be considered in patients with systemic symptoms or fevers. A wet ear following AOM with perforation (AOMwP) should be considered for combination ciprofloxacin/steroid drops to reduce otorrhoea from middle ear inflammation.[11] Discharging AOM refractory to first-line treatment, with persistent perforation after six weeks or with symptoms of meningism, facial nerve weakness or other abnormal neurology, should be referred for ENT review.

Chronic suppurative otitis media

Chronic suppurative otitis media (CSOM) is characterised by persistent otorrhoea through a TM perforation due to chronic middle ear inflammation.[2,11] Patients present with a history of over two to six weeks of persistent discharge and will often have mild to moderate conductive hearing loss.[6] First-line treatment involves ciprofloxacin/steroid combination drops, followed by targeted drops and microsuction if available.[11] Recurrent courses of oral and ototopical antibiotics, particularly if not guided by microscopy and culture, are unlikely to be of additional benefit. Patients with symptoms refractory to medical management should be evaluated with audiometry and CT imaging to assess for middle ear disease, and might require referral to an ENT service for consideration of surgery.[6]

Cholesteatoma

Cholesteatomas are skin cysts filled with squamous debris that can cause inflammation, infection and destruction in the middle ear and mastoid.[12] Cholesteatomas can be congenital or acquired and might follow long-standing ear drum retraction and Eustachian tube dysfunction.[12] Otorrhoea usually occurs in the setting of an infected cholesteatoma and might persist despite ototopical treatment. Patients suspicious for cholesteatoma should be referred for audiometry, CT and specialist otolaryngologist review. Extensive cholesteatomas can pose a threat to hearing, balance and facial nerve function, with a risk of intracranial infection.[12]

CSF otorrhoea

CSF otorrhoea is characterised by reproducible, positional, watery discharge, often with a history of head trauma.[8,9] A traumatic CSF leakage can also occur but

is mostly seen in patients with intracranial hypertension or alternative causes of skull base bony erosion.[8] CSF is thin and will often be described as a tap-like drip. Fluid should be collected and sent for beta-2-transferrin to confirm the presence of CSF, following which patients should be referred for urgent specialist review. Temporal bone CT helps assess for bony dehiscence that might provide CSF passage, while MRI might be a useful adjunct in localising the presence of fluid.[9]

Foreign bodies

Aural foreign bodies (FBs) might present with otorrhoea from secondary OE, particularly if not promptly removed.[13] Common retained FBs include beads, small plastic toys and hearing aid tips. Button batteries must not be missed. Removal of the FB is normally sufficient to address the otorrhoea and might be performed under direct vision or microscopy. ENT referral should be considered for FBs lodged in unfavourable positions, prior unsuccessful attempts or for button batteries. Patients with associated OE or EAC trauma should be considered for antimicrobial drops.[13,14]

Post-grommet otorrhoea

Grommets (tympanostomy tubes) are inserted in patients with recurrent middle ear infections or effusions to equalise middle ear pressures and relieve symptoms. Otorrhoea is theorised to occur either due to recurrent OM or a secondary foreign body–like reaction with potential biofilm formation.[15] Management can be initiated in general practice with ciprofloxacin/steroid combination drops.[16] Persistent otorrhoea despite this treatment might need specialist assessment for aural toilet, treatment escalation or grommet removal.

Malignancy

Neoplastic lesions of the ear are rare but recognised causes of otorrhoea. Cranial nerve abnormalities, significant pain and associated hearing loss should prompt specialist referral. Otorrhoea in the setting of suspected malignant lesions might be refractory to drops and warrants a low threshold for ENT evaluation.

Barotrauma

Patients with history suggestive of barotrauma might present with serosanguinous otorrhoea among other symptoms, which normally occurs as a result of middle ear oedema and bleeding following injury.[17,18] Barotraumatic discharge is normally self-limiting in nature, but clinicians should have a low threshold to consider antibiotic and steroid combination drops in the setting of persistent otorrhoea or suspected infective change.[17,18]

Conclusion

Otorrhoea is a frequent ENT presentation in the general practice setting with broad differential diagnoses. This article has outlined an approach for the general practitioner to systematically assess and manage many of the common causes of otorrhoea and identify when escalation to a specialist ENT service might be warranted.

Key points

- A good clinical history and examination are essential when approaching the discharging ear.
- Audiometry and CT imaging are useful adjuncts in the setting of persistent or refractory otorrhoea.
- Ototopical therapy, dry mopping and aural toilet are the first line of treatment when managing most causes of otorrhoea.
- Ciprofloxacin-based drops are preferred when TM perforation cannot be ruled out.
- Specialist referral should be considered for persistent otorrhoea failing conservative management, for red flag symptoms or for suspected complications.

Authors

Raymond Li MD, ENT Principal House Officer, Department of Otorhinolaryngology, Sunshine Coast University Hospital, Sunshine Coast, Qld

Kristy Fraser-Kirk BA (Psych), MBBS (Hons), FRACS (OHNS), ENT Consultant, Department of Otorhinolaryngology, Sunshine Coast University Hospital, Sunshine Coast, Qld

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Correspondence to:
ray.mndli95@gmail.com

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Hypertensive disorders in pregnancy: Approach to diagnosis and management in general practice

Vanessa Fowosere

Background
Hypertensive disorders in pregnancy (HDIP) are among the leading causes of maternal and perinatal morbidity and mortality and should not be reserved for specialist care and expertise.[1] General practitioners (GPs) are inevitably involved in the care of women with HDIP, particularly in the preconception, early pregnancy and postpartum periods and, also, as shared maternity care providers. It is, therefore, critical that GPs can assess and manage HDIP.

Objective
This article aims to provide GPs with a practical approach to the diagnosis and management of hypertensive disorders in pregnancy, including postpartum monitoring and ongoing cardiovascular risk surveillance.

Discussion
The spectrum of HDIP includes gestational hypertension, chronic hypertension, pre-eclampsia (PET)/eclampsia and PET superimposed on chronic (pre-existing) hypertension, and this can affect up to 8–10% of pregnant women.

THE RISKS associated with uncontrolled blood pressure in pregnancy are significant, which further underpins the importance of general practitioners (GPs) recognising this spectrum of disorders, including gestational hypertension, chronic hypertension, pre-eclampsia (PET)/eclampsia and PET superimposed on chronic (pre-existing) hypertension (Box 1).[1–4] Up to 8–10% of pregnant women are affected by hypertensive disorders in pregnancy (HDIP).[4] The maternal risks include cardiac and cerebrovascular complications, such as reduced cardiac output, pulmonary oedema, stroke, seizure and encephalopathy.[1,2,5] Foetal and uteroplacental risks include foetal growth restriction and placental abruption.[1,2,5]

Aim

This article outlines a practical approach to managing HDIP for GPs that involves identifying patients at risk, making a diagnosis and management, including postpartum monitoring and ongoing cardiovascular risk surveillance.

Identifying patients at higher risk of PET

The following risk factors should be assessed in each patient as a means of risk stratification (Table 1), where the presence of one or more major risk factors or two or more moderate risk factors confers a higher risk for developing PET.[2,6] Where accessible, combined first-trimester screening (sonographic and serum-based biomarkers) is an additional tool that can help maximise a patient's risk assessment for PET.[2] Those patients who are at higher risk of developing PET should be commenced on prophylactic treatment with low-dose aspirin (150 mg daily) and calcium (>1 g daily),[2] which have been demonstrated to be significant in reducing the risk of PET if commenced before 16 weeks' gestation (and as early as 12 weeks).[2,4,6,7]

Other considerations for reducing an individual's risk for PET are encouraging healthy lifestyle choices, exercise and weight management, and effectively managing pre-existing hypertension and other medical conditions.[6]

Diagnosis of hypertensive disorders in pregnancy

The diagnosis of HDIP is the measurement of elevated systolic blood pressure in a pregnant patient of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg, on two occasions, at least 15 minutes apart.[1,2] Part of the assessment involves reviewing the patient's symptoms and examining the patient for signs consistent with HDIP (Box 2).

Where an HDIP is diagnosed (or suspected), a workup should take place, including an assessment of proteinuria and PET bloods. Serial foetal growth ultrasound

Box 1. Spectrum of hypertensive disorders in pregnancy[1–4]

Gestational hypertension is defined as a new onset of hypertension (systolic ≥140 or diastolic ≥90 mmHg) after 20 weeks' gestation, with nil associated proteinuria or manifestations of PET, and resolves by 12 weeks postpartum.

Chronic (pre-existing) hypertension is defined as high blood pressure that is diagnosed any time before 20 weeks' gestation or that does not resolve by 12 weeks postpartum.

Pre-eclampsia/Eclampsia is defined as the development of high blood pressure after 20 weeks' gestation, plus evidence of other end-organ dysfunction, including renal (proteinuria, oliguria, raised creatinine), haematological (thrombocytopenia, haemolysis, DIC), hepatic (raised transaminases, epigastric/right upper quadrant abdominal pain), neurological (headaches, visual disturbances, hyperreflexia and clonus, generalised seizures of eclampsia, stroke) and foetal (intrauterine growth restriction) manifestations.

HELLP syndrome is defined as haemolysis, elevated liver enzymes and low platelets and occurs in 20% of severe PET cases.

PET superimposed on chronic (pre-existing) hypertension

DIC, disseminated intravascular coagulation; PET, pre-eclampsia.

Table 1. Risk factors for PET[1,2,6]

High risk factors	Moderate risk factors
• Chronic hypertension	• Family history of PET
• Previous hypertensive disorder in pregnancy	• BMI ≥35 kg/m^2
• Chronic kidney disease	• Age ≥40 years
• Diabetes mellitus	• Nulliparity
• Autoimmune disease (eg lupus or antiphospholipid syndrome)	• Interpregnancy gap of >10 years
• Multiple gestation	• Reproductive technology assisted pregnancy
	• Blood pressure systolic reading ≥130 mmHg and/or diastolic ≥80 mmHg

BMI, body mass index; PET, pre-eclampsia.

scans are also indicated given the risk for foetal growth restriction in HDIP.[6] This workup (Box 3) forms the basis of HDIP monitoring antenatally.

From a GP's perspective, once a persistently elevated blood pressure has been recorded in a consult, the patient should be referred urgently to a tertiary healthcare centre or obstetric unit for a full assessment and initiation of investigations by a health professional trained in managing HDIP.[6] It is in this setting that the timing of antenatal visits, HDIP assessments, foetal growth and wellbeing surveillance, delivery timing and use of corticosteroids for foetal lung maturation can be decided on.[6] However, it should be appreciated that GPs in more rural settings might have to initiate some of these investigations themselves, with remote advice.

Management of hypertensive disorders in pregnancy

Management principles include managing other medical conditions and initiation of antihypertensive therapy to control blood pressure. Labetalol, methyldopa and nifedipine modified-release tablets have demonstrated safety and efficacy in managing HDIP (Table 2).[2,6–8] Prazosin, clonidine and hydralazine can also be used in HDIP but are second-line agents that should be deferred to specialist use.[2,6]

In chronic hypertension, patients taking angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB) or thiazide diuretics should be counselled on the increased risk of congenital abnormalities if they are taken during pregnancy and switched to an alternative agent.[6]

Other management considerations are regular antenatal visits, HDIP assessments and foetal growth and wellbeing surveillance, overseen by a secondary-level health professional trained in managing HDIP.[6]

Indications for referral to a tertiary unit for consideration of admission are elevated blood pressure (ie ≥140/90 to ≤159/109 mmHg) and clinical concerns for maternal or foetal wellbeing, or severe blood pressure (ie ≥160/110 mmHg).[6]

HELLP syndrome

In 20% of severe cases of PET, HELLP syndrome or haemolysis, elevated liver enzymes and low platelets ensue as part of the manifestation of severe disease.[9,10] Complications secondary to the syndrome include placental abruption, placental failure, extreme prematurity and maternal cardiac and cerebrovascular complications, amounting to a 7–70% perinatal mortality rate and a 1–24% maternal mortality rate.[10] For this reason, clinicians involved in maternity care must be able to recognise this syndrome. In a rare subset of HELLP cases, haematological and biochemical derangement might even precede hypertension and proteinuria; therefore, hypertension and proteinuria are not essential for its diagnosis.[9,10] This is known as atypical HELLP syndrome.[9,10] If HELLP syndrome is suspected, patients need to be urgently referred to a tertiary obstetric unit for specialised review and management.

Timing of birth

The decision on the timing of birth should involve a discussion with a senior obstetrician and the patient. In HDIP patients without PET with blood pressures below 160/110 mmHg, delivery should not be offered before 37 weeks' gestation unless there is another medical indication for delivery.[2,6] In the setting of PET, thresholds for delivery before 37 weeks need to be determined by a senior obstetrician with the patient. These include refractory blood pressure on three or more agents, abnormal dopplers, abnormal cardiotocograph, placental abruption, persistent neurological symptoms (eg intractable headache, visual disturbances or eclampsia) or HELLP syndrome.[2,6] For patients with PET, birth is recommended at 37 weeks' gestation.[2,6]

Box 2. Symptoms and examination findings suggestive of a hypertensive disorder in pregnancy[1,2,6]

Symptoms:

- Headaches
- Nausea/vomiting
- Visual disturbance
- Swelling
- Epigastric/right upper quadrant abdominal pain

Signs:

- Elevated blood pressure (≥140 mmHg and/or diastolic blood pressure of ≥90 mmHg)
- Clonus ≥3 beats
- Hyperreflexia
- Epigastric/right upper quadrant tenderness
- Oedema
- Visual disturbance (blurred vision, diplopia, scotoma)

Table 2. First-line antihypertensive medications used in hypertensive disorders in pregnancy[2,6–8]

Antihypertensive	Class/ Mechanism of action	Dose	Adverse effects
Labetalol	Beta blocker	100 mg bd–400 mg tds–qid	Bronchospasm, headache, bradycardia
Methyldopa	Central action	250 mg bd–750 mg tds–qid	Depression, dry mouth, sedation
Nifedipine modified release	Calcium channel blocker	20 mg od–60 mg bd	Headache (first dose effect), flushing, tachycardia, peripheral oedema

If preterm birth is expected in <34 weeks' gestation, corticosteroids are recommended for foetal lung maturation,[2,6] but this decision needs to be made by a senior obstetrician in consultation with the patient.

Postpartum surveillance

On discharge from a maternity unit or care, it is important that the resolution of an HDIP is monitored and chronic hypertension continues to be managed effectively. Therefore, a postpartum plan should be communicated with the GP that clearly dictates the frequency of blood pressure reviews required.

Blood pressure peaks on days 3–6 postnatally in both normotensive and HDIP patients.[7] Review within this period is usually attended to by domiciliary midwives in Australia but might be required of a GP. Thereafter, a woman's GP will need to provide regular reviews to monitor their blood pressure based on their control, including titrating their antihypertensive therapy if they are still requiring it.

At six weeks, GPs perform a routine postpartum review, which should include measurement of blood pressure, and again a review of symptoms and signs suggestive of HDIP. It should be noted that hypertension including PET can be diagnosed in the postpartum period and certainly up to six weeks postpartum.[3]

Women taking methyldopa should be changed to an alternative agent secondary to the susceptibility to postnatal depression while on the agent.[2,6,7] Labetalol and nifedipine modified-release tablets continue to be safe to use in the postpartum period,[2,6,7] but it is good practice to change to enalapril (5 mg od–10 mg bd), which has also been shown to demonstrate safety and efficacy and might be preferred secondary to less dosing in comparison to labetalol and nifedipine.[2,6] These medications are all safe in breastfeeding.

It is important to recognise that where gestational hypertension and PET do not resolve by 12 weeks, this might herald essential hypertension, but secondary causes of hypertension need to be considered.[2]

Future hypertension and cardiovascular risk surveillance

There is an increased risk of hypertension and cardiovascular disease in women who have been diagnosed with an HDIP.[2,6] GPs should advise their patients to reduce this risk by encouraging healthy lifestyle choices, including smoking cessation, exercise and weight management, and effectively managing co-existing medical conditions.[6] It is reasonable to check blood pressure and perform a cardiovascular risk assessment annually in women who have had an HDIP and who do not have essential hypertension.

In subsequent pregnancies, the risk of HDIP is approximately 20%.[6] Therefore, it is important that GPs discuss the recommendation for prophylactic low-dose aspirin and calcium from as early as 12 weeks in subsequent pregnancies to reduce the risk of PET.[2,4,6,7]

Conclusion

Hypertensive disorders in pregnancy are not an entity reserved for specialist care. They are driven by specialist care, but GPs are inevitably involved, predominately in the preconception, early pregnancy and postpartum periods and as shared maternity care providers. This article has provided a practical guide for GPs on how their role is instrumental in identifying those at higher risk of HDIP early and escalating their antenatal care pathway accordingly, commencing low-dose aspirin and calcium from as early as 12 weeks in women at higher risk of PET,[2,4,6,7] monitoring HDIP in the postpartum period, and undertaking ongoing cardiovascular risk surveillance.

Box 3. Workup of hypertensive disorder in pregnancy[1,2,6]

Assessment of proteinuria

- Bedside urinalysis: positive if 1+; send urine for quantitative analysis
- Protein-creatinine ratio: positive if ≥30 mg/mmol
- Albumin-creatinine ratio: positive if ≥8 mg/mmol

PET bloods

- FBE: looking for thrombocytopenia
- UEC: looking for raised creatinine
- LFTs: looking for raised transaminases
- Coagulation studies: looking for increased coagulopathy

Foetal ultrasound assessment

- For chronic hypertension → Early dating ultrasound then growth scans at 28, 32 and 36 weeks' gestation
- For gestational hypertension → Growth scan at time of diagnosis then 3–4 weekly
- For pre-eclampsia → Growth scan at time of diagnosis then fortnightly plus fortnightly AFI + Doppler assessment OR
- As otherwise directed by specialist care

AFI, amniotic fluid index; FBE, full blood examination; LFT, liver function test; PET, pre-eclampsia; UEC, urea, electrolytes, creatinine.

Key points

- The spectrum of HDIP includes gestational hypertension, chronic hypertension, PET/eclampsia and PET superimposed on chronic (pre-existing) hypertension.
- Prophylactic aspirin and calcium should be commenced as early as 12 weeks (and before 16 weeks) in women at higher risk of PET.
- Labetalol, methyldopa and nifedipine modified-release tablets have demonstrated safety and efficacy in managing HDIP.
- In the postpartum period, GPs will need to provide regular reviews to monitor their patients' blood pressure based on their control, including titrating their antihypertensive therapy if they are still requiring it.
- It is reasonable to check blood pressure and perform a cardiovascular risk assessment annually in women who have had an HDIP and who do not have essential hypertension.

Author

Vanessa Fowosere BMed, Obstetrics and Gynaecology Senior Health Medical Officer, Joan Kirner Women's and Children's Hospital, Melbourne, Vic

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Correspondence to:
vanfow.97@hotmail.com

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Melasma management in primary care

Tim Aung, Ebtisam Elghblawi, Sandy T Aung

Background
Melasma, a condition characterised by hyperpigmented patches on the face, is one of the common skin conditions in women seeking treatment from primary care practitioners (PCPs). Several treatment modalities are available for PCPs as well as dermatologists. Each treatment option has its pros and cons, including accessibility and cost.

Objective
This article aims to explore and address the treatment options that PCPs can offer for melasma.

Discussion
This article outlines how to offer treatment from the PCP's perspective conveniently and cost-effectively. Combined topical treatment seems to be the first-line form that PCPs can offer and manage in the general practice setting. Of the various treatments available, the triple combination of topical hydroquinone with retinoid and corticosteroid is widely described in the literature.

MELASMA, also known historically as chloasma or the mask of pregnancy, is an acquired skin hyperpigmentary disorder and is common among adult women. Melasma is characterised by brown or dark-brown pigmentation symmetrically involving the face: cheeks, forehead, nose, upper lip, chin and jawline. Figure 1 shows melasma in a woman and in a man. Melasma may start with macules that later become large patches with ill-defined borders and no pruritus. Based on the depth of pigment infiltration as determined using a Wood lamp, dermatoscope or histology, melasma is divided into epidermal, dermal and mixed (combined epidermal and dermal) types.[1,2]

Although the prevalence of melasma globally has been reported to be 1% based on data from Western countries, its prevalence is actually much higher, especially in women with skin of colour, namely those with Fitzpatrick phototypes III–V (ie those of Asian, Middle Eastern, Mediterranean African and Hispanic/Latin American descent), commonly affecting those aged 30–50 years.[3–5] In this population of women, the actual prevalence of melasma has been reported to range from 9% to 40%, with higher rates among South Asian and Southeast Asian women.[3–6] Aboriginal and Torres Strait Islander and Polynesian women are also affected, although no exact data have been established for these groups. Men can also be affected by melasma, but this is rare, with a male to female ratio of 1:9.[4] In women, melasma can cause psychological morbidity, with aesthetic concerns and low self-esteem affecting quality of life. Thus, it is important to know how to manage melasma at the primary care practice (PCP) level when it is encountered.

Common differential diagnoses for melasma are listed in Table 1.[5,6] Melasma can readily be diagnosed clinically based on the distribution and characteristics of pigmentation, as well as skin type or ethnicity, and a biopsy is rarely required. The cause of melasma is complex and multifactorial, and the precise aetiopathogenesis remains largely unknown. However, the risk factors listed in Box 1 are related to the development of melasma,[1,5,7,8] and are important to identify and address.

Management

Melasma treatment aims to diminish pigmentation by halting the proliferation of melanocytes, and the formation and degradation of melanosomes. There are several treatment modalities for melasma, as outlined below.

The first step, adopting general skin care protection measures, is always important. This includes reducing risk factors for the development of melasma, such as avoiding sun exposure and the use of hormonal contraceptives (if possible), phototoxic medications and certain cosmetics. Because sunlight can enhance pigmentation, sun protection during outings, including wearing a wide-brimmed hat or using an umbrella and the use of broad-spectrum tinted sunscreens (SPF ≥30), is recommended. Cosmetic camouflage is also a useful option.

Table 1. Differential diagnoses for facial hyperpigmentary conditions

Condition	Characteristics
Melasma	Reproductive age but mostly in ages 30–50 years Brown or dark-brown facial hyperpigmentation macules and patches in Fitzpatrick skin phototypes III–V (skin colour). No pruritus
Postinflammatory hyperpigmentation	Any age and any site with prior inflammatory erythema in the area (eg prior contact dermatitis [pigmented cosmetic dermatitis] that can result from sensitising chemicals in cosmetic products)
Drug-induced pigmentation/ photosensitivity	Any age Blue or slate-grey pigmentation over the face, limbs, trunk and mucosa Tetracyclines, antiepileptics, sulphonamides, antimalarial and non-steroidal anti-inflammatory drugs are common culprits
Actinic lichen planus (pigmented form)	Adults Pigmented erythematous patches or plaques over sun-exposed sites (face, neck and dorsum of hands)
Solar lentigines	Fair-skinned individuals (Fitzpatrick skin phototypes I–III) Discrete, well-demarcated, pigmented macules over sun-exposed sites (face, neck and upper limbs)
Discoid lupus erythematosus	Typically in young adult women Scaly erythematous patch or plaque over the face and scalp; look for autoimmune-associated manifestations
Frictional melanosis	Adults At any site, resulting from excessive and repeated mechanical stimulation to skin (actively or passively rubbing/friction)
Naevus of Hori	Adult Asian women Blue-grey to grey-brown patchy and spotty pigmentation on bilateral cheeks and less often on the forehead, nose and eyelids The condition is often misdiagnosed because it may resemble or coexist with melasma
Poikiloderma of Civatte	Adult women Linear telangiectasia, erythema, mottled hyperpigmentation symmetrically on sun-exposed areas (cheeks, neck and upper chest)

Regarding specific treatment for melasma, there are both pharmacological and non-pharmacological options.

Pharmacological treatment

The wide range of pharmacological treatment options for melasma, including topical and systemic therapy, is detailed below.[4,5,9]

Topical treatments

Triple combined topical therapy consisting of hydroquinone (HQ), a potent lightening agent, with retinoid and corticosteroid is recommended as first-line therapy due to its efficacy and non-invasive nature compared with other modalities.[5,9,10] Examples of triple combined topical therapy include Kligman's formula (5% HQ + 0.1% tretinoin + 0.1% dexamethasone) or Tri-Luma (Galderma Laboratories LP, Fort Worth, TX, USA; 4% HQ + 0.05% tretinoin + 0.01% fluocinolone acetonide), which should be applied once daily over the lesion for four weeks and the melasma then reassessed. Treatment will take three to six months and adverse effects are minimal and may include skin irritation, erythema and post-irritant dyspigmentation. It is important to halt or cease an HQ-containing regimen if there is significant irritation because it may lead to postinflammatory dyspigmentation or ochronosis. The inclusion of a low-potency corticosteroid in the combined form is to counter or minimise such irritation, and to lessen some degree of hyperpigmentation. Retinoid works by reducing melanin synthesis, enhancing the penetration of other ingredients and improving skin tone from keratinocyte/epidermal turnover.[1,10] HQ should not be used during pregnancy because its absorption through the skin is significant.[11] The use of topical retinoids is also discouraged during pregnancy, albeit systemic absorption is reported to be negligible.[12,13] These topical forms are currently not listed under the Pharmaceutical Benefits Scheme in Australia, although Tri-Luma has been approved for use in the US by the US Food and Drug Administration (FDA). In Australia, this form of combined topical treatment can be prescribed by customised script and made up by a compounding pharmacy. Practitioners can create a script for the combined topical form in practice software (Setup>Custom preparation) to print out when required.

Given Kligman's formula can be modified with various ingredients and strengths, low- to medium-strength topical corticosteroids such as hydrocortisone 1%, betamethasone valerate 0.02% or triamcinolone acetonide 0.02% can be considered as interchangeable if dexamethasone 0.1% and fluocinolone acetonide 0.01% are unavailable in Australasia.[14] Maintenance treatment with twice weekly (or appropriate frequency) application is recommended in view of easy relapse after stopping the treatment.

Other topical forms include single-agent treatments such as HQ (2–5%), azelaic acid (5–20%), kojic acid (1–2%), cysteamine cream (5%), ascorbic acid (5–15%), niacinamide (2–5%), tranexamic acid (TXA; 2–5%), glutathione (2%), tretinoin (0.05–0.1%) and corticosteroid (mild to mid-strength). Of note, combined treatment or the addition of an adjuvant generally offers better efficacy and effectiveness.[1,4,9,10] A list of agents useful for the treatment of melasma, along with their mechanisms of action and side effects, is provided in Table 2.[1,5,15]

Systemic treatments

Among the systemic treatments available for melasma, namely oral TXA, carotenoids

Box 1. Risk factors related to melasma

Light exposure: sunlight and visible/artificial light, especially cumulative exposure

Genetic predisposition (20–50% positive family history)[5,7]

Hormonal: hormonal contraception and pregnancy (15–50% of pregnancies)[7]

Photosensitive medications (eg minocycline, doxycycline, non-steroidal anti-inflammatory drugs, antiepileptics, cytotoxics, psychotropics) and the use of some cosmetics

Thyroid disorder (claimed to be, but needs further robust evidence)[8]

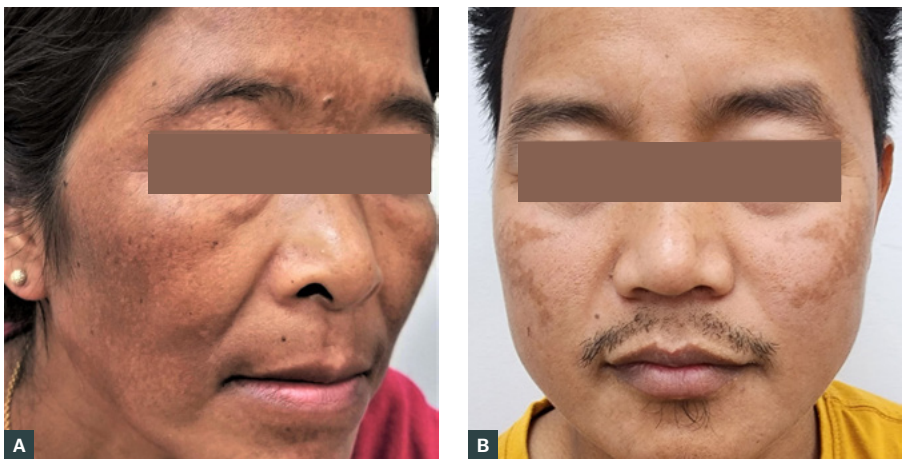

Figure 1. Melasma in (**A**) a woman and (**B**) a man.

(lutein/zeaxanthin), glutathione and *Polypodium leucotomos* extract, TXA has been widely studied, including in randomised controlled trials, and has been shown to have favourable effects.[16,17] TXA, which is mainly used for heavy menstrual bleeding, may be cost-effectively prescribed by general practitioners in Australasia. The proposed oral dosage is 250 mg twice daily or 500 mg daily for three to six months.[16–18] In cases of severe melasma (extensive areas with dermal involvement) or melasma recalcitrant to topical therapy, a combined oral TXA with topical regimen has been reported to deliver better outcomes.[3,17] The benefits of TXA in melasma treatment outweigh unlikely minor side effects (headache, epigastric pain, hypomenorrhoea and a theoretical risk of thrombosis), given the utilisation of a lower dosage.[1,17]

Non-pharmacological treatment

Non-pharmacological treatment modalities for melasma are generally beyond the capacity of general practitioners. These modalities include microneedling, chemical peeling, dermabrasion, light-based therapy (intense pulsed light, broadband light, pulsed dye laser), and laser therapy (Q-switched [QS] ruby, QS-Nd:YAG, ablative and non-ablative fractional lasers); unpredictable or mixed results have been reported from these treatment forms.[4–6,19] Non-pharmacological treatment modalities are not cheaper than the pharmacological regimens described above and are not free from adverse effects either, such as erythema, paradoxical dyspigmentation, post-laser scar and even relapse. Currently, picosecond laser (1064 mm) is claimed to be effective with improved side-effect profile, but robust studies are needed to confirm this.[20,21] Non-pharmacological treatment modalities should be reserved for patients for whom conventional treatment has failed or according to patient choice, with referral to a dermatologist or dermatologist-preferred specialist laser technician being warranted.

Melasma in pregnancy

Melasma in pregnancy may be transient and generally improve after delivery.[1] Topical TXA, azelaic acid and kojic acid (Category B2) are favoured for the treatment of melasma during pregnancy if the patient wishes to be treated. To note, more novel treatments are expected to emerge, because no satisfactory treatment for melasma has been established to date. Recurrence or refractoriness to treatment is not uncommon for this chronic disorder. Melasma may clear up spontaneously, but its duration is unpredictable and depends on an individual's risk factors and the severity of the lesions.

Conclusion

In the management of melasma, PCPs can play a vital role in initial assessment and treatment. Although dermatological expertise is necessary for sophisticated treatment forms, PCPs can effectively initiate treatment for melasma using combined topical therapies (with or without adjunct oral TXA) and follow-up. Melasma that is refractory to topical treatment or a patient's choice for advanced therapy would warrant referral to a dermatologist.

Key points

- Melasma is a common skin condition among women, causing psychological morbidity and affecting quality of life.
- PCPs can manage melasma with topical treatment.
- Triple combined topical therapy (HQ, retinoid and corticosteroid) can be prescribed and obtained from a compounding pharmacy if ready-made preparations are unavailable.
- Referral to a dermatologist is warranted for advanced forms of treatment that are beyond the capacity of PCPs.

Authors

Tim Aung FRACGP, FRNZCGP, Dip in General Derm and Skin Cancer Surgery, Certificate in Dermatoscope, Honorary Adjunct Assistant Professor, General Practice, Bond University, Gold Coast, Qld; Senior Lecturer, General Practice Clinical Unit, University of Queensland, Brisbane, Qld; Primary Care Practitioner, Star Medical Centre – Woodridge, Logan, Qld

Ebtisam Elghblawi MBBCh, MScRes, ADD, DRH, Dip in Dermatoscope, Dermatologist, St James Hospital, Tripoli, Libya

Table 2. Topical agents used in the treatment of melasma with their mode of action and adverse effects

Agent	Mechanism of action	Adverse effects
Hydroquinone (2–5%)	• Inhibits melanin synthesis by inhibiting the enzyme tyrosinase • Causes necrosis of melanocytes	Irritation and onchronosis, especially with high doses and/or extended use
Retinoid (tretinoin; 0.05–0.1%)	• Rapid loss of the pigment via epidermopoiesis and increased epidermal/keratinocyte turnover • Reduces tyrosinase activity	Irritant dermatitis and photosensitisation
Corticosteroid (low potency)	• Pigmentation fades due to reduced melanogenesis and anti-inflammatory effect	No significant effects from low potency
Azelaic acid (5–20%)	• Inhibits tyrosinase on aberrant melanocytes • Anti-inflammatory effect	Irritation, dryness and pruritus
Kojic acid (1–2%)	• Inhibits tyrosinase	Irritation
Ascorbic acid (vitamin C; 5–15%)	• Antioxidant: chelates copper ions, which serve as a cofactor for tyrosinase activity	No significant effects from topical application
Niacinamide (2-5%)	• Reduces melanosome transfer • Anti-inflammatory properties • Anti-ageing effects	No significant effects from topical application
Tranexamic acid (2–5%)	• Disrupts melanin synthesis by blocking binding of plasmin/plasminogen to keratinocytes • Shrinks the dermal vasculature	Erythema, scaling, dryness and irritation
Cysteamine cream (5%)	• Inhibits tyrosinase, halting melanin production	No significant effects from topical application
Glutathione (2%)	• Decreases tyrosinase activity • Proposed to be an anti-oxidant and reduce melanogenesis	No significant effects from topical application

Sandy T Aung BPharm (UQ), Senior Pharmacist, Logan Hospital, Logan, Qld

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Correspondence to:
tim.aung@uq.edu.au

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correspondence **ajgp@racgp.org.au**

Tremor: A systematic approach

Jun Hua Bowen Lim, Victoria Newgreen, Paul Kopanidis

Background
Tremor is a common but complex involuntary movement disorder often first assessed by general practitioners (GPs). Due to its diverse causes and manifestations, an accurate assessment of a patient's tremor helps guide initial investigations and treatments.

Objective
The purpose of this paper is to equip GPs with a framework for the identification, diagnosis and management of different types of tremors.

Discussion
This paper offers a comprehensive, current overview of tremor assessment in general practice. It particularly focuses on Parkinson's disease, essential tremor syndrome and dystonic tremor, while highlighting diagnostic masquerades and red flags for urgent neurological evaluation.

TREMOR IS DEFINED by the International Parkinson and Movement Disorder Society as an involuntary, rhythmic, oscillatory movement of a body part.[1] Tremor is a common, physically and psychosocially debilitating symptom frequently encountered in clinical practice.[1,2] Tremor is often one clinical feature of a disease process and has a diverse range of aetiologies. This paper outlines an approach to the evaluation of tremor, the most common tremor syndromes and important clinical masquerades.

Describing tremor

Developing an approach to describe tremor is required to effectively evaluate and monitor response to treatment. To systematically assess tremor, describe each of the characteristics listed in Table 1, beginning with the activating condition and location. Other observed characteristics include axis, amplitude, constancy, frequency and regularity.[1,3] Table 1 provides detailed explanations of these characteristics and the clinical relevance of each.

History

History taking is vital to consider the aetiology of a tremor presentation. Table 2 outlines the key aspects a clinician may evaluate in taking a focused tremor history. Particular reference is made to different features of common tremor syndromes.

Examination

Examining a patient's tremor requires careful observation and a methodical approach. Techniques that can supplement general inspection, vital signs and a thorough neurological examination for associated features (eg extrapyramidal features) are presented in Table 3.

Tremor syndromes

After categorising the tremor based on the key features of the examination, it is important to consider the most common tremor presentations to general practice. Below, we discuss clinical insights into common tremor syndromes, with less common tremor syndromes outlined in Table 4.

Essential tremor syndrome

Essential tremor (ET) is the primary cause of action tremor worldwide, affecting approximately 1% of the population and increasing to 5% among those aged over 60 years.[4] Despite its prevalence, ET remains frequently misdiagnosed.[5] The disease imposes a significant burden, with an estimated one million US patients currently untreated.[6] The pathophysiology of ET is thought to involve dysfunction in the cerebello-thalamo-cortical network, with degenerative changes in the Purkinje cells of the cerebellum.[3]

ET is characterised by an action tremor occurring without any other neurological

Table 1. Definitions of different characteristics used to describe tremor and the clinical relevance of each

Term	Explanation	Clinical relevance
Activating condition	The activating condition specifies whether a tremor is a rest or action tremor An action tremor is further categorised into specific action: postural, kinetic, isometric or intention tremor	PD is commonly associated with rest tremor, compared with the kinetic tremor noted in ET An asymmetric rest tremor is often present during walking in PD patients
Location	Refers to the body part or parts where the tremor is manifested (ie upper limbs, lower limbs, head/neck and voice) and whether it is symmetrical	An asymmetric upper limb rest tremor is common at the onset of PD[16] ET typically presents with a symmetric upper limb kinetic tremor[4] Head/neck tremor is more common in dystonic tremor or ET[4,17,24]
Axis	Describes the plane or direction in which the tremor occurs around a joint	PD tremor often has a characteristic distal axis (ie pill-rolling tremor)[4] ET is more likely to have a proximal axis (eg wrist flexion and extension axis of tremor)[4]
Amplitude	The distance of movement, often described as fine, moderate or coarse[25]	Amplitude relates to the severity of tremor in PD[26] In ET, typically the amplitude of kinetic tremor is greater than postural tremor[7]
Constancy	Observe the proportion of time a rest tremor is present during an examination	Patients in the earlier stages of PD may have an intermittent rest tremor[14] In ET, tremor is constantly present during kinetic movements[4]
Regularity	A regular tremor has uniform oscillations, whereas an irregular tremor has variable oscillations	Functional tremor is often irregular and distractable[21] Position- or task-specific tremor with irregular 'flurries' of tremor suggest dystonic tremor[27]
Frequency	Refers to the rate of oscillation of the tremor and is often classified as low frequency (<4 Hz), medium frequency (4–7 Hz) or high frequency (>7 Hz)	Frequency may be low (eg rubral tremor), medium (eg PD, ET) or high (eg enhanced physiological tremor or orthostatic tremor)[27]

ET, essential tremor; PD, Parkinson's disease.

condition.[1] To fulfil the ET diagnostic criteria, a patient must have an isolated tremor syndrome characterised by bilateral upper limb action tremor lasting for at least three years, possibly involving tremor in other locations, including the head, voice or lower limbs.[1] An ET tremor may be mildly asymmetric, initially affecting the upper limbs.[4,7] The 2018 International Parkinson and Movement Disorder Society's tremor classification allows for 'soft neurological signs' in ET, such as mild impaired tandem gait or subtle dystonic posturing, which may be referred to as ET plus syndrome.[1]

Management of ET starts with eliminating exacerbating medications and substances, such as caffeine. The evidence supports propranolol as an initial therapy, with later consideration of primidone.[8,9] If first-line therapy fails, combination treatments or a transition to second-line agents like gabapentin or topiramate may be warranted.[10,11] Existing treatments are often discontinued due to lack of effectiveness or tolerability, underscoring the urgent need for more effective therapeutic options.[6] Interventional treatment includes incisionless magnetic resonance imaging–guided focused ultrasound (MRIgFUS), which targets nuclei in the thalamus, and the invasive insertion of a deep brain stimulation device.[3]

Parkinsonism and tremor

Tremor is most commonly associated with idiopathic Parkinson's disease (PD) with 40–65% of PD patients having a resting tremor at presentation.[3] PD affects approximately 1% of adults aged over 70 years,[4] and results from the degeneration of dopaminergic neurons in the substantia nigra, causing striatal dopamine deficiency and disrupted motor control.[3]

A parkinsonian tremor is a resting tremor of 4–7 Hz frequency,[3] often starting unilaterally in one distal upper limb ('pill-rolling'). An action (kinetic) tremor develops in a significant proportion of PD patients as the disease progresses.[12] The kinetic tremor in PD characteristically has a re-emergence postural tremor, which is a brief delay in tremor emergence after holding a certain posture.[13] Accompanying features required for a PD diagnosis include decrementing bradykinesia, cogwheel rigidity and postural instability. Noting other abnormalities, including gait disturbance with the presence of a tremulous distal upper limb that does not swing, is useful. Response to levodopa is a component of the diagnostic criteria and is first-line treatment.[14]

In other parkinsonian syndromes, like Lewy body dementia, progressive supranuclear palsy, multiple system atrophy and vascular parkinsonism, a rest tremor is less prevalent.[15] However, other forms of kinetic tremor may be present, such as the irregular, jerky postural and kinetic

Table 2. Key aspects in taking a focused tremor history, with a short description of clinical relevance

Key aspect	Description of clinical relevance
Age at onset	ET typically has a bimodal age distribution, peaking in the second and third decades of life and in the seventh and eighth decades of life[28] PD often manifests in older age groups, with its incidence rising after the age of 60 years[4]
Characteristics of onset and progression	An abrupt onset could suggest an acute insult such as stroke; however, psychogenic tremors may also present acutely A gradually worsening tremor is often described in ET and PD
Triggering factors and relieving factors	Tremor may be task specific in dystonic tremor ET is generally relieved by alcohol intake; however, this is a non-specific feature[4] Stress, anxiety and emotional excitement can worsen tremors in PD and various other forms of tremor[29]
Distribution	The body parts affected by the tremor, as well as its symmetry, can be significant indicators of the underlying condition; for example, head tremor is common in ET and rare in PD, whereas a leg tremor is more common in PD than ET[7] ET commonly presents as a bilateral, mostly symmetric action tremor in the hands and arms In PD, tremor typically starts unilaterally[7]
Associated symptoms	The patient should also be asked about other neurological symptoms that they may be experiencing PD is often associated with loss of dexterity, gait disturbance, hypophonia and stiffness. Noting other features, such as anosmia and REM sleep disturbance, may be supportive of a PD diagnosis[14]
Medication and substance history	Antiseizure medications, antipsychotics, lithium, metoclopramide, antidepressants, alcohol withdrawal, steroids, β-adrenoceptor agonists, amiodarone, calcium channel blockers, chemotherapy agents, immunosuppressants such as tacrolimus, caffeine and nicotine can induce tremor
Family history	In about half the cases of ET, the family history indicates an autosomal dominant inheritance pattern Although PD is generally sporadic, around 15% of patients do have a family history[30]
Impact on quality of life	Assess the psychosocial impact and daily function

ET, essential tremor; PD, Parkinson's disease; REM, rapid eye movement.

tremor seen in multiple system atrophy parkinsonian subtype.[16]

Dystonic tremor

Dystonia is a movement disorder causing sustained muscle contractions that result in abnormal, repetitive and often twisting movements. Dystonic tremor may worsen with specific voluntary actions, and includes unintentional muscle activation in adjacent areas to the tremor.[17] Dystonic tremor is a specific form of tremor that occurs when sustained contractions of dystonic muscles have an overlying spasm that appears rhythmic. The tremor is usually an action tremor that has a postural component.[4]

The most common areas affected by dystonic tremor are the neck and upper limbs.[3] When observing dystonic tremor, a distinctive feature is an irregular, jerky multidirectional tremor with 'flurries' that deviate from a consistent oscillatory pattern.[3] On examination, there may be specific clues present, such as:

- geste antagoniste (when a specific manoeuvre temporarily eases the tremor); for instance, touching the cheek might diminish a neck tremor in cervical dystonia[17,18]
- null point (a particular joint position where the dystonic tremor is either greatly reduced or absent); this may be noted when rotating the head in a certain direction in cervical dystonia.[17,18]

Botulinum toxin injections are considered first-line treatment for many forms of focal dystonia, including cervical dystonia.[3] Other medications, such as anticholinergic agents like trihexyphenidyl, may be considered. Treatment-refractory patients may be appropriate for MRIgFUS or deep brain stimulation procedures.

Medication-induced tremor

Medication-induced tremor arises from various drugs, often by enhancing physiological tremor. Common culprits include steroids, caffeine and β-adrenoceptor agonists like salbutamol. Tremors can also result from medication toxicity, such as antiseizure medications. Sodium valproate causes tremors resembling ET in up to 25% of users. The severity of the tremor may be dose dependent (and may occur within the therapeutic dose range of the drug).[19,20]

Drug-induced tremor secondary to lithium is the most common tremor encountered in clinical practice. Up to 65% of individuals on lithium experience tremor.[20] This tremor is typically postural and kinetic, with a high frequency (eg 8–12 Hz). This can manifest across a broad range of lithium concentrations and a normal lithium concentration does not rule out drug-induced tremor, especially in

Table 3. Focused examination of tremor

Phase	Assessment technique	Illustration	Observations and clinical relevance
Initial observation	Start observing the patient's tremor as they are called into the consultation room, paying attention to how they transition from sitting to standing and their gait		Difficulty transitioning from sitting to standing may indicate parkinsonian syndromes, but may also indicate a proximal myopathy A stooped posture or shuffling gait with the presence of a tremulous upper limb that does not swing may also indicate parkinsonism A broad-based gait could suggest proprioceptive or cerebellar impairments
Assessment of resting tremor	Observe the patient in a resting position with their hands prone on their lap		Observe whether the patient has a resting tremor If a tremor is observed at rest, accentuation with mental tasks can be evaluated by asking the patient to close their eyes and name the months of the year backwards.[4] Cognitive load will increase the amplitude or reveal a subtle intermittent rest tremor in PD[31]
Assessment of postural tremor	Ask the patient to position their arms outstretched and in the wing-beating position (arms horizontally oriented with the palms facing downward while the shoulders are in an abducted position and the elbows are flexed)		This test reveals the severity of the proximal postural component of the tremor syndrome, which is often increased in ET[4,7] A wing-beating tremor with dystonic posturing is also a characteristic feature of Wilson's disease[4]
Identifying the presence of dysmetria or intention tremor	Perform the finger–nose test: ask the patient to repeatedly touch their nose and then the examiner's finger (this assesses coordination and may elicit tremors that worsen with targeted movement)		An intention tremor is classically characterised by a crescendo increase in tremor as the finger reaches its target Intention tremors are classically associated with cerebellar pathology and are found in patients with cerebellar lesions from pathologies such as stroke or plaques from multiple sclerosis[2] Notably, intention tremors can also occur with ET, but in these cases they are typically not accompanied by other cerebellar signs, such as dysmetria
Task-specific tremor	Observe a task that results in tremor, such as drinking from a cup Note how the tremor changes as the patient approaches the target Pay attention to any compensatory strategies used (eg drinking with two hands instead of one)		Dystonic tremor is task or position specific with irregular 'flurries' of tremor observed
Bradykinesia	Ask the patient to perform thumb–index finger tapping for approximately 10 repetitions Note changes in the speed and amplitude of the action over time		Bradykinesia is a cardinal feature of PD and refers to both the generalised slowness with decrementing amplitude of movement
Rigidity	Examine the tone of a relaxed limb by passively moving the joint throughout its range of motion Note any cogwheel rigidity		Rigidity is a cardinal feature of PD, and typically manifests on the same side as a PD tremor[4] Cogwheel rigidity is thought to be due to a tremor superimposed on increased muscle tone. It manifests as a ratcheting pattern of resistance throughout the passive movement of a limb and can intensify with voluntary contralateral arm movements

Table continued on the next page

Table 3. Focused examination of tremor (cont'd)

Writing and drawing	Observe the patient while they write a long sentence Ask the patient to draw an Archimedes spiral (see Figure 1)	When writing a long sentence the following may be observed: • Micrographic (progressively smaller handwriting) often indicates PD • Uniform tremor oscillations may suggest essential tremor or primary writing tremor The Archimedes spiral task can reveal tremor characteristics and severity. When drawing an Archimedes spiral the following may be observed:[32] • PD may show a tight, micrographic tremulous spiral • ET often exhibits consistent oscillations, worse at the 2 o'clock – 8 o'clock axis. • Dystonic tremor may display irregular, multidirectional oscillations

ET, essential tremor; PD, Parkinson's disease.

the elderly and those with chronic kidney disease. Antidepressants such as selective serotonin reuptake inhibitors and tricyclic antidepressants can cause an enhanced physiological tremor, or worsen an underlying tremor syndrome.[20]

Antipsychotic-induced extrapyramidal side effects can present as tardive tremor or drug-induced parkinsonism, often with bilateral upper limb resting and kinetic tremor. There may be other drug-induced features, such as tardive dyskinesia (eg involuntary oral buccal movements).[3] Other dopamine-depleting drugs, such as metoclopramide, can have a similar presentation.[20]

Other important causes of drug-induced tremor are immunosuppressive medications, such as tacrolimus.[20] They cause an action postural or intention tremor that is related to dose. Other causes of tremor include amiodarone, calcium channel blockers and chemotherapy agents (including vincristine, cisplatin, paclitaxel, doxorubicin, cytarabine and methotrexate).[20]

Enhanced physiological tremor

Enhanced physiological tremor is a high-frequency symmetric postural and kinetic tremor in the upper limbs that may intensify under specific environmental or physiological conditions. If not caused by medications, other considerations include anxiety, fatigue, illicit drug use, alcohol withdrawal, hypoglycaemia, excessive caffeine consumption, hyperthyroidism and toxin exposure.[3]

Functional tremor syndrome

Functional tremor syndrome can present in isolation or with other functional neurological disorder symptoms. Patients with functional tremor may report a sudden onset following a physical event like injury or illness, or a stressful life event.[21] Features suggesting a functional tremor syndrome include fluctuating findings of the tremor location, frequency and activation characteristics.[21] There may be accompanying history of somatisation symptoms or psychiatric history.[21] If functional tremor is suspected, additional specific provocative features to note include the following:

- Distractibility is assessed with distraction tasks. Functional tremors may improve, subside or change in frequency and amplitude during distraction tasks. For example, the examiner should monitor for interruption of contralateral limb tremor while asking the patient to perform finger tapping.[21]
- Entrainability is assessed by observing whether the frequency of the symptomatic limb postural or rest tremor can be synchronised with a voluntary rhythmic movement in the contralateral side (eg to the beat of an examiner's clap).[21]
- Suggestibility can be noted during the neurological examination. For example, note migration of the tremor location to a previous asymptomatic area while assessing the tone of a limb.[21]

Masquerades of tremor and red flags

Tremors are commonly encountered in general practice, and recognising their masquerades is essential for general practitioners (GPs) to identify patients needing urgent management, including the treatment of systemic conditions. Enhanced physiological tremor prompts a thorough assessment for other systemic causes, as discussed earlier. In addition, consideration of other forms of hyperkinetic movements that may resemble a tremor is required.

Myoclonus can appear similar to tremor, but it differs from tremor in its lack of rhythm and presence of directionality, whereas

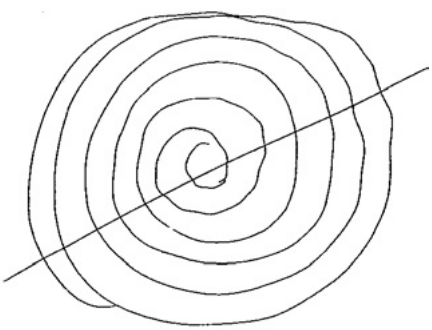

Figure 1. Archimedes spiral performed by a patient with a mild essential tremor syndrome. Note the tremor is in the typical 2 o'clock – 8 o'clock axis for essential tremor syndrome, with a line drawn by the clinician between these points.

Table 4. Less common tremor syndromes encountered in clinical practice

Tremor type	Clinical features
Cerebellar tremor	Intention tremor with associated features of dysmetria, dysarthria and wide-based gait
Neuropathic tremor	Action relatively symmetric limb tremor that may be associated with chronic inflammatory demyelinating neuropathy[33] Associated positive Romberg sign and neuropathy features
Orthostatic tremor	High-frequency fine tremor typically in the legs that occurs shortly after standing, resulting in a tendency to fall if stationary[3]
Rubral tremor	A low-frequency unilateral limb tremor worse with kinetic movement, often with a rest tremor component May develop acutely after a stroke (eg midbrain stroke)[34]
Multiple sclerosis-related tremor	Intention and postural tremor are two major components in multiple sclerosis tremor
Tremors associated with genetic disorders	Vary based on the underlying genetic condition; examples include Fragile X syndrome[4] and Klinefelter syndrome[4]
Age-related tremor	Late-onset non-disabling action tremor, particularly in patients with a high burden of cerebrovascular disease[35]
Indeterminate tremor	Non-specific tremor features and failure to meet criteria for known tremor types or underlying neurological condition[3]
Isolated head tremor	Tremor isolated to the head without clear dystonic features[3]
Palatal tremor	Symptomatic palatal tremor involves low-frequency, semirhythmic movements of the soft palate, typically combined with ataxia, and is usually attributed to a lesion in the dentato-olivary pathway

tremor oscillates between the same points. Myoclonus may also be drug induced or relate to systemic disease (eg due to renal or liver failure, CO_2 retention or medication side effects). Patients with negative myoclonus (also known as asterixis) from CO_2 retention or liver failure may describe their own condition as a 'tremor'.[4]

Although rare, certain red flags in tremor evaluation demand urgent attention.[22] An abrupt onset with accompanying symptoms like weakness, loss of dexterity or slurred speech raises concerns for stroke. A rapid progression of tremor (days–weeks) with dysarthria, ataxia, seizures or gait disturbances raises concern for a possible immune-mediated disorder, underlying neoplasm or drug toxicity.[22] Patients with a sudden-onset unilateral inability to use a limb with continuous focal 'twitching' that can spread to the face may have continuous focal seizures due to epilepsia partialis continua. Encountering these signs should prompt clinicians to consider referral to the emergency department for further assessment.

Investigations to consider

If an acquired cause or treatable metabolic disorder is suspected, routine blood tests can be useful. These may include a full blood count, urea, electrolytes, creatinine, liver function tests, blood glucose, thyroid function and relevant drug levels.

Generally, magnetic resonance imaging of the brain is recommended for patients with tremor if there is suspicion of structural brain abnormalities, an asymmetric tremor with sudden onset that may indicate vascular pathology or when a heritable neurodegenerative or metabolic disorder is considered in the differential diagnosis.[23]

Conclusion

Tremor has a diverse range of aetiologies and requires a framework for assessment. GPs are pivotal in the diagnostic process and management of tremor syndromes, including identifying common treatable conditions and masquerades.

Key points

- Tremors present a complex diagnostic challenge for many clinicians due to the broad range of causes.
- A framework for characterising tremor is essential for accurate diagnosis.
- Undertake a thorough drug history to identify possible medication-induced tremor.
- Consider red flags in a tremor syndrome to identify other systemic medical conditions.

Authors

Jun Hua Bowen Lim BAdvSci (Hons), MD, Resident Medical Officer, Department of Neurology, Northern Health, Melbourne, Vic

Victoria Newgreen MBBS, DipChildHealth, DRANZCOG, FRACGP, General Practitioner, cohealth, Melbourne, Vic

Paul Kopanidis MBBS (Hons), FRACP, Neurologist, Department of Neurology, Northern Health, Melbourne, Vic; Neurologist, Department of Neurology, Austin Health, Melbourne, Vic

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Correspondence to:
pkopanidis@live.com

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correspondence **ajgp@racgp.org.au**

Once bitten, twice shy: Antimicrobial stewardship in the setting of arthropod-associated superficial lymphangitis

Melinda Jiang, Christina Guo, Stephen Bacchi

CASE

A man, aged 31 years, wakes to find a pruritic erythematous papule on the anterior aspect of his right forearm, approximately 5 mm in diameter, with a central haemorrhagic punctum. The previous day he had been gardening in his metropolitan Australian home when he felt something crawling on the same right forearm, which was promptly squashed and hence subsequently unidentifiable. Over the following 24 hours, despite refraining from scratching the papule, he developed a well-demarcated erythematous linear streak originating from the papule and extending proximally to the cubital fossa (Figure 1). There was no associated pain, tenderness on palpation, induration, palpable cord-like thickening or palpable lymphadenopathy. The patient was systematically well and afebrile. He had no past medical history and no regular medications. However, five years prior, he recalled a history of a similarly pruritic papule followed by streak-like erythema on his lower leg, again following gardening (Figure 2).

QUESTION 1

Which types of differential should be considered for this skin lesion?

QUESTION 2

What are the possible aetiologies of superficial lymphangitis?

QUESTION 3

How would you treat bacterial lymphangitis?

QUESTION 4

How can you treat arthropod-associated superficial lymphangitis?

ANSWER 1

The well-demarcated linear region of erythema raises several possibilities. In particular, superficial lymphangitis and superficial thrombophlebitis are relevant considerations. In this instance, the presumed mode of acquisition, the lack of a palpable vein, the short duration of time between the bite and development of erythema, and the lack of systemic symptoms make arthropod-associated superficial lymphangitis the most likely diagnosis. Phytophotodermatitis may be considered as a differential; however, the distribution of the erythema in this case clearly extends from the punctum and follows the course of the lymphatic vessels, supporting the diagnosis of lymphangitis.

ANSWER 2

Superficial lymphangitis can be caused by both bacterial and non-bacterial aetiologies. Classical bacterial causes of acute lymphangitis (Table 1) include *Streptococcus pyogenes* and *Staphylococcus aureus*.[1] Bacterial lymphangitis can be associated with clinical features such as fever and local lymphadenopathy.[2] Non-bacterial causes of acute superficial lymphangitis are diverse and less common. These aetiologies include viral (particularly from herpes simplex), fungal (particularly from *Sporothrix schenckii)* and parasitic infections, as well as arthropod-associated lymphangitis (Table 1).[3]

The pathophysiology of arthropod-associated superficial lymphangitis remains unknown; however, it is believed to involve a toxic or allergic process induced by the secretions of athropods.[4] It is thought that a linear spread of the inflammation occurs due to the contiguous diffusion of the toxin and/or the inflammatory mediators through the lymphatics adjacent to the dermis.[4] Previously reported cases describe that it is not uncommon that the offending arthropod cannot be identified, or that a bite itself was

not observed.[5] However, when identifiable, the implicated arthropods have included mosquitos, spiders and scorpions.[6,7]

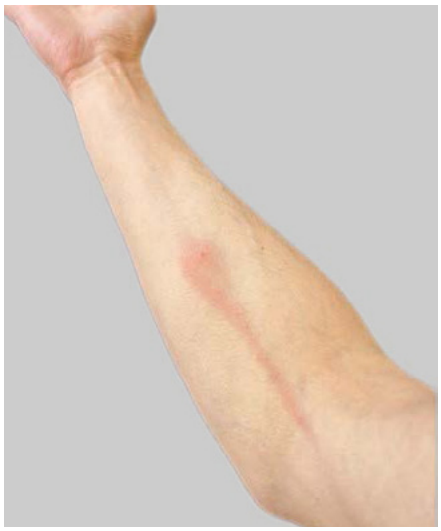

Figure 1. A well-demarcated, linear erythematous streak originating from a papule with a central, crusted punctum on the anterior forearm of the patient 24 hours after the papule was first noted.

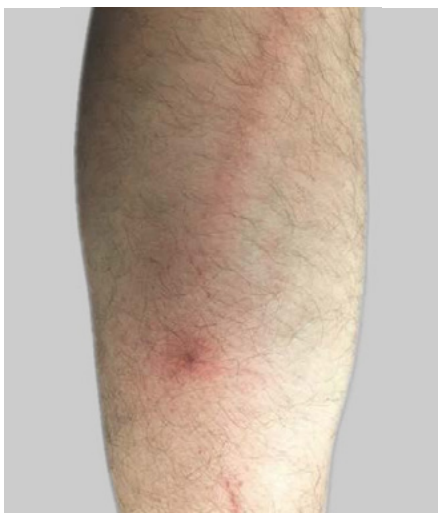

Figure 2. Previous leg lesion (five years prior) demonstrating a well-demarcated, linear erythematous streak, originating from an erythematous papule with a central crusted punctum, extending proximally along the posterior aspect of the calf.

ANSWER 3

Typically, bacterial lymphangitis requires an antibiotic regimen with empirical streptococcal and staphylococcal coverage, such as flucloxacillin.[1,2] Less commonly, lymphangitis may be caused by alternative bacteria, such as *Pasteurella multocida*, which can be acquired through cat and dog bites.[3] Empiric antimicrobial therapy for soft tissue infections associated with cat and dog bites typically includes antibiotics such as amoxicillin–clavulanate. Populations with special considerations may require individualised antibiotic regimens, such as greater Gram-negative bacterial coverage in immunocompromised individuals.

ANSWER 4

Arthropod-associated lymphangitis has previously been an under-recognised cause of such presentations. In the literature, a number of cases have been described in case series, demonstrating that this diagnosis is a distinct pathological entity.[4,7] Furthermore, these cases have been managed successfully without antimicrobial therapy. In these cases, patients were managed successfully with antihistamines and/or topical corticosteroids.[7] Such described cases managed without antimicrobials have also included paediatric populations.

In the case of presumed arthropod-associated superficial lymphangitis, clinical monitoring for progression or the development of systemic symptoms is required irrespective of antimicrobial prescription. In a patient for whom the diagnosis was unclear, or who could not be reliably monitored, the decision to prescribe an empirical antimicrobial course may be reasonable. However, in appropriately selected cases, monitoring without antimicrobials could be undertaken following a risk-versus-benefit discussion with the patient, as has been described previously.[7] Relevant factors to consider include the patient's comorbidities, immunosuppression, health literacy and likelihood of adherence to instructions.

Case continued

In this case, it was considered that the diagnosis was most likely arthropod-associated lymphangitis. The inability to identify the original culprit organism limited diagnostic evaluation further. The patient was managed conservatively. Close clinical monitoring was used. Over the following day, the erythema extended approximately a further 5 cm proximally, before gradually resolving over two to three days. No antimicrobials were required. Counselling was undertaken regarding appropriate gardening attire to help minimise the risk of recurrence.

Key points

- Linear erythematous lesions have a differential diagnosis including lymphangitis, superficial thrombophlebitis and allergic contact dermatitis.
- Lymphangitis can be due to bacterial infection, non-bacterial infection and non-infectious aetiologies.
- Although primary bacterial infection or superinfection should always be carefully considered, cases of arthropod-associated lymphangitis can be successfully managed without antimicrobial therapy.

Authors

Melinda Jiang BClinSc MD, Clinical Associate Lecturer, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, SA

Christina Guo MD, Medical Officer, Department of Infectious Diseases, The Alfred Hospital, Melbourne, Vic

Stephen Bacchi MBBS, PhD, Medical Officer, Department of Medicine, Lyell McEwin Hospital, Adelaide, SA; Associate Professor, Faculty of Medicine and Public Health, Royal Adelaide Hospital, Adelaide, SA

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Correspondence to:
melinda.jiang@sa.gov.au

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Table 1. Comparison of the clinical characteristics and management of arthropod-associated superficial lymphangitis, acute lymphangitis, herpes simplex lymphangitis and sporotrichoid lymphocutaneous infection

	Arthropod-associated superficial lymphangitis	Acute bacterial lymphangitis	Herpes simplex lymphangitis	Sporotrichoid lymphocutaneous infection
Typical presentation	Linear erythematous streak originating from an erythematous macule or papule with a central haemorrhagic punctum, extending proximally along the course of a lymphatic vessel[3,4]	Linear erythematous streak extending proximally along an extremity, following the course of a lymphatic vessel[1,2]	Vesicular lesions associated with lymphangitic streaking May occur secondary to herpetic whitlow[3]	Nodular lymphangitis involving multiple asymptomatic (or mildly tender) nodules extending in a linear fashion along the infected arm or leg Nodules may ulcerate[8,9]
Aetiology/associations	Arthropod bite (non-infectious)[3]	Bacterial infection with cellulitis, most commonly *Streptococcus pyogenes*[2,7]	Viral infection from herpes simplex virus[3,10]	Fungal infection from *Sporothrix schenckii*[8,9]
Symptoms	Usually pruritic and non-tender[7]	Usually tender or painful[2]	May be tender or painful[3,11]	Usually tender or painful[8,9]
Fever or systemic symptoms	Usually absent[7]	Usually present[2]	May be present[3]	Usually absent[8,9]
Lymphadenopathy	May be absent[7]	Usually present[1]	May be present[11]	May be present[8]
Treatment	Self-limiting Consider symptomatic treatment with topical corticosteroids and/or oral antihistamines if required[3]	Antibiotic therapy and analgesia[1,2]	Self-limiting: natural history of 14–21 days[10] Early antiviral therapy can be considered[10,11]	Oral potassium iodide solution or oral antifungal agents[8,9]

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correspondence **ajgp@racgp.org.au**

Impact of the COVID-19 pandemic on the diagnosis and management of primary cutaneous melanomas in New South Wales, Australia: A retrospective cohort study

Meryl Thomas, Maria Jones-Caballero, Marlene Wijaya, Pablo Fernandez-Penas, Raquel Ruiz Araujo

Background and objective
The COVID-19 pandemic caused upheaval of healthcare systems, with evolving consequences. The aim of this study was to evaluate the impact of the pandemic on melanoma diagnosis and management in New South Wales, Australia.

Methods
In this retrospective cohort study, we analysed all new melanomas diagnosed at a tertiary care hospital over a three-year period. We compared outcomes between pre-pandemic (1 January 2019 – 30 March 2020) and pandemic (31 March 2020 – 31 December 2021) periods.

Results
A total of 426 melanomas were included. No significant differences in patient demographics, Breslow thickness, ulceration, subtype or lymph node positivity were observed. During the pandemic, there was an 11% decrease in the number of melanomas diagnosed in the community (P=0.016) and an 11-day reduction in time from referral to wide local excision (P=0.013).

Discussion
The prioritisation of melanoma care during the pandemic in New South Wales, Australia, has resulted in no apparent diagnostic delays.

THE COVID-19 pandemic was a challenge for health systems worldwide. There were 13% fewer melanoma diagnoses in Victoria, Australia, in the first six months of the pandemic, compared with the same period in 2019.[1] In the US, a study found that melanomas newly diagnosed during the pandemic had poorer prognostic markers such as high mitotic rates and greater incidence of ulceration.[2] Numerous studies from across Europe reported an increase in the average Breslow thickness and a decrease in the number of melanoma diagnoses after the onset of the pandemic.[3,4]

Australia has the highest incidence of melanoma in the world.[5] If a lesion is suspected to be melanoma, an excisional biopsy is performed whenever possible. Excisional biopsy provides prognostic information, such as Breslow thickness, which cannot be reliably obtained through a punch biopsy.[6] If the diagnosis is confirmed, a wider excision is performed around the biopsy scar. For all patients with melanomas ≥1 mm in thickness or >0.8 mm thick with other high-risk pathological features, sentinel lymph node biopsy should be considered.[7] If opting for a sentinel lymph node biopsy, it should be performed at the time of the initial wide local excision.[7]

In New South Wales (NSW), more than 50% of melanoma diagnoses are made by general practitioners (GPs).[8] Most GPs refer thick melanomas to a surgeon or dermatologist for definitive management and perform wide local excision of in situ or thin melanomas themselves.[9] GPs perform around 50% of wide local excisions in Australia, with dermatologists performing 16% and surgeons the remaining 34%.[10]

The mortality rate from COVID-19 in Australia was less than one-quarter the rate in the UK and US.[11] COVID-19 policies varied widely across the country after the first case was reported in January 2020. NSW entered a strict lockdown on 31 March 2020, allowing residents to only leave their homes for essential reasons. These orders eased a few months later as case numbers dropped. However, Sydney re-entered a lockdown for four months between June and October 2021 after an outbreak of the Delta strain.[12] In Victoria, Melbourne residents spent 263 days in lockdown between 2020 and 2021, which is the second longest time spent in lockdown of any city in the world.[13] Restrictions in other states and territories were less stringent.[13]

Few studies to date have explored the impact of the COVID-19 pandemic on melanoma morbidity and management in Australia. Analysis of Medicare Benefits Schedule (MBS) data found a 29% decrease in skin checks in general practice in the second quarter of 2020.[14] The Victorian Melanoma Service found a 48% reduction in new referrals during lockdown, and an increase in the average Breslow thickness of invasive melanomas from 2.06 to 2.70 mm.[15]

The aim of the present study was to investigate the impact of COVID-19 pandemic restrictions on melanoma management and characteristics in a public tertiary referral hospital in NSW, Australia.

Table 1. Patient demographics overall and during the pre-COVID-19 pandemic and pandemic periods separately

	Total	Pre-pandemic period (1 January 2019 – 30 March 2020)	Pandemic period (31 March 2020 – 31 December 2021)	*P* value
No. patients	426	177 (41.5)	249 (58.5)	
Age (years)		67.4±14.8	68.2±15.4	0.601
Age groups (years)				0.337
≤40	29 (6.8)	13 (7.3)	16 (6.5)	
41–60	94 (22.1)	35 (19.6)	59 (23.9)	
61–80	226 (53.1)	102 (57.6)	124 (49.8)	
>81	77 (18.1)	27 (15.1)	50 (20.2)	
Sex				0.921
Male	272 (63.8)	114 (64.4)	158 (63.5)	
Female	154 (36.2)	63 (35.6)	91 (36.5)	

Unless indicated otherwise, data are given as the mean±SD or n (%).

SD, standard deviation.

Methods

This retrospective cohort study was conducted at Westmead Hospital, a public tertiary hospital in NSW, Australia. Data were collected on patients diagnosed with melanoma between 1 January 2019 and 31 December 2021.

This interval comprised the 16 months prior to the beginning of a strict lockdown in NSW (31 March 2020) and the 20 months after (pre-pandemic group: 1 January 2019 – 30 March 2020).

From 31 March 2020, NSW entered a strict five-week lockdown prohibiting people from leaving their home other than for essential reasons. Non-urgent outpatient clinics were cancelled or postponed, and there was increased uptake of telehealth in general practice. Further waves of the pandemic and periodic lockdowns meant there were changes to healthcare delivery throughout the rest of 2020 and 2021 (pandemic group: 31 March 2020 – 31 December 2021).

Data were collected in 2022 from electronic medical records. The inclusion criteria for this study were:

- adult patients with a new, histopathological diagnosis of cutaneous melanoma during the study period
- biopsy and/or wide local excision performed at Westmead Hospital.

Epidemiological data on age and sex, clinical data (time of biopsy, time of referral from GP or private dermatologist, time of wide local excision) and histological data (Breslow thickness, ulceration, subtype, spread to lymph nodes) were collected for all patients where available.

'Biopsy' refers to any biopsy type (ie excisional, incisional, punch or shave). 'Wide local excision' refers to surgical excision of the melanoma, aiming for clear margins, after the diagnosis has been confirmed through a biopsy.

A descriptive analysis of the data was performed. Categorical variables are presented as absolute numbers with percentages. Numeric variables are presented as the mean and standard deviation (SD) or median with interquartile range (IQR) depending on data distribution.

Univariate analysis of normally distributed continuous variables was performed using the independent samples t-test. Non-normally distributed continuous variables were analysed using non-parametric tests (Mann–Whitney U test). Univariate analysis of categorical variables was performed using the Pearson Chi-squared test. Those differences that had a *P* value <0.05 were accepted as statistically significant.

A multivariate analysis was not performed because there were no significant differences in the epidemiological or histological data variables before and during the pandemic when univariate analysis was performed.

R software (R Foundation for Statistical Computing, Vienna, Austria) was used for the statistical analysis.

The study was approved by the Human Research Ethics Committee of Westmead Hospital (HREC 2110-09).

Results

Patient demographics

Patient demographics are summarised in Table 1. The study sample comprised 177 melanomas (41.5%) in the pre-pandemic group and 249 in the pandemic group (58.5%). In total, 64.4% of the pre-pandemic population was male, compared to 63.5% of the pandemic population. Overall, the majority (53.1%) of patients were aged 61–80 years, with 57.6% of pre-pandemic patients and 49.8% of pandemic patients falling into this category. The mean age of patients in the pre-pandemic and pandemic groups was 67.4 and 68.2 years, respectively. There were no significant differences in the sex and age of patients before and after the onset of the pandemic (*P*=0.921 and *P*=0.601, respectively; Table 1).

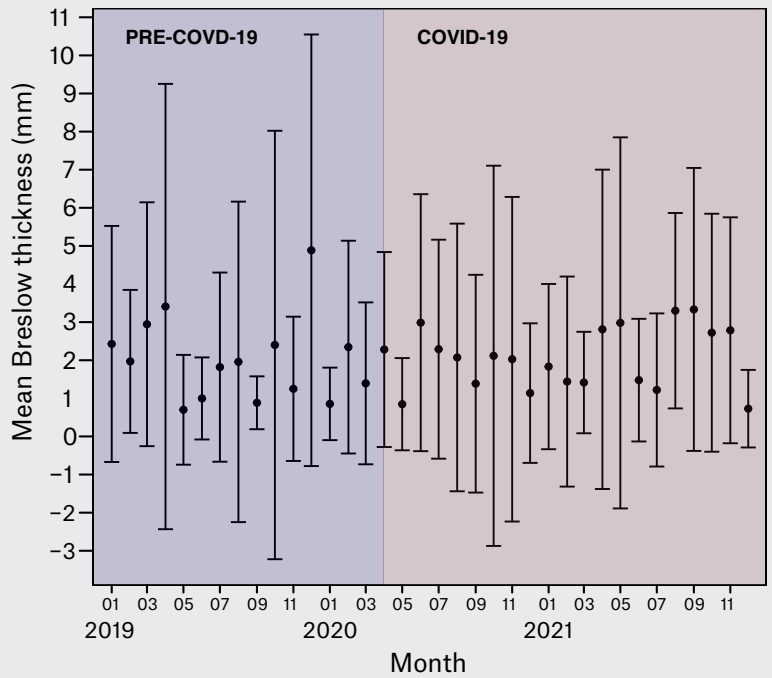

Figure 1. Monthly mean Breslow thickness (per month) of newly diagnosed melanomas before and during the COVID-19 pandemic. Error bars indicate the standard deviation.

Melanoma prognostic characteristics

Regarding melanoma prognostic and histological characteristics (Table 2), superficial spreading melanoma was the most commonly obtained histological subtype in both the pre-pandemic and pandemic groups, with an overall prevalence of 38.4% in the entire study cohort. No significant differences regarding histological subtypes were observed (*P*=0.909). The mean Breslow thickness per month prior to the pandemic ranged from 0.7 to 4.9 mm, compared with 0.7 to 3.3 mm during the pandemic (Figure 1). Nearly one-third of melanomas excised during the study period were in situ (31.3%), 30.1% pre-pandemic and 32.1% during the pandemic. The median Breslow thickness during the pre-pandemic period was 0.8 mm (IQR 0.0–2.3 mm) compared with 0.7 mm (IQR 0.0–2.5 mm) during the pandemic (*P*=0.767). When comparing only invasive melanomas, the median Breslow thickness was 1.5 mm in both groups, with an IQR of 0.7–3.5 and 0.6–4.0 in the pre-pandemic and pandemic groups, respectively. In the pre-pandemic group, 30.4% of melanomas were ulcerated, compared with 33.1% during the pandemic (*P*=0.724). Pre-pandemic, 31.9% of wide local excisions also included lymph node biopsy, compared with 36.6% during the pandemic (*P*=0.397). In cases where a lymph node biopsy was performed, 26.4% and 30.1% were positive pre-pandemic and during the pandemic, respectively (*P*=0.786).

Clinical data

During the study period, in the three years between 2019 and 2021, 426 cutaneous melanomas were diagnosed. Of all examined lesions, 177 (41.5%) were obtained prior to the pandemic and 249 (58.5%) were obtained during the pandemic. This equates to 11.8±4.5 and 11.3±4.3 diagnosed cases per month prior to and during the pandemic, respectively. Pre-pandemic, 78.5% of lesions were identified in the community by a GP or private dermatologist, with patients then referred for further management at Westmead Hospital. The remaining lesions (21.5%) were identified in outpatient dermatology or surgical oncology clinics at the hospital. During the pandemic, there was a decrease in the proportion of cases identified in the community (67.5%) and an increase of cases identified in hospital clinics (32.5%). This was a statistically significant result (*P*=0.016). In cases in which the biopsy was performed in the community prior to hospital referral, the median time from biopsy to referral for wide local excision was seven days in both the pre-pandemic and pandemic cohorts. The median time from referral to wide local excision decreased during the pandemic (Figure 2), from 50 days pre-pandemic to 39 days during the pandemic. This was a statistically significant result (*P*=0.013). The median time from biopsy to wide local excision was 48 days pre-pandemic, compared with 43 days during the pandemic. This was not a statistically significant result (*P*=0.239; Table 3).

Discussion

In the short term, Australia's stringent lockdowns were effective in preventing a massive loss of life from COVID-19.[16] However, it is necessary to worry about the long-term impacts of these lockdowns.

There was a 29% decrease in the rate of skin checks in general practice in the second quarter of 2020 compared with the second quarter of 2019.[14] This is in line with our findings, which showed a shift towards melanoma detection within outpatient hospital clinics as opposed to with GPs and private dermatologists. Prior to the pandemic, 78.5% of melanomas were identified in the community, compared with 67.5% during the pandemic.

The reduction in skin checks might be explained by the dramatic uptake in telehealth by GPs. Almost half (48.7%) of the Australian population used GP telehealth services between April and December 2020, compared with <2% in the same period in 2019.[17] Australian general practice guidelines advise performing skin checks opportunistically, or if concern is raised about a specific lesion.[18] Regular screening skin examinations are only recommended for patients that fit high-risk criteria.[18]

Table 2. Melanoma prognostic and histological characteristics overall and during the pre-COVID-19 pandemic and pandemic periods separately

	Total	Pre-pandemic period (1 January 2019 – 30 March 2020)	Pandemic period (31 March 2020 – 31 December 2021)	*P* value
No. patients		177 (41.5)	249 (58.5)	
Subtype				0.909
Superficial spreading	127 (38.4)	56 (40.6)	71 (36.8)	
Nodular	54 (16.3)	22 (15.9)	32 (16.6)	
Lentigo maligna	101 (30.5)	41 (29.7)	60 (31.1)	
All others	49 (14.8)	19 (13.8)	30 (15.5)	
Breslow thickness (mm)		0.8 [0.0–2.3]	0.7 [0.0–2.5]	0.804
Breslow thickness (mm) of invasive melanomas only		1.5 [0.7–3.5]	1.5 [0.6–4.0]	0.843
Breslow thickness (mm)				0.767
0	131 (31.3)	52 (30.1)	79 (32.1)	
0.01–0.50	104 (24.8)	44 (25.4)	60 (24.4)	
0.51–1	62 (14.8)	29 (16.8)	33 (13.4)	
>1	122 (29.1)	48 (27.8)	74 (30.1)	
Ulcerations present				0.724
Yes	88 (32.0)	34 (30.4)	54 (33.1)	
No	187 (68.0)	78 (69.6)	109 (66.9)	
Lymph nodes biopsied				0.397
Yes	136 (34.6)	53 (31.9)	83 (36.6)	
No	257 (65.4)	113 (68.1)	144 (63.4)	
Positive lymph nodes				0.786
Yes	39 (28.7)	14 (26.4)	25 (30.1)	
No	97 (71.3)	39 (73.6)	58 (69.9)	

Unless indicated otherwise, data are given as the median [interquartile range] or n (%).

GPs cannot perform opportunistic skin exams, and patients cannot present suspicious skin lesions, during a telephone consultation. In addition, most Australian dermatologists believe it is inappropriate to perform skin checks via telehealth.[19]

Studies across the US and Europe have shown a decrease in melanoma diagnoses,[2,20,21] an increase in Breslow thickness[2,20–25] and a higher proportion of advanced-stage melanomas during the pandemic.[2,20,26] A meta-analysis of several European studies found a 0.29-mm increase in mean Breslow thickness and a significantly higher rate of diagnosis of Stage III melanomas (odds ratio 1.58).[27]
Several explanations have been provided, including cancellation or delay of appointments due to lockdown restrictions[2] and the shifting of healthcare resources from outpatient settings to inpatient care.[22] The increased uptake of telehealth was suggested to have been detrimental to melanoma detection,[25] and some patients might have avoided seeking care due to fear of infection.[20,23] In Italy, 49% of dermatologists saw their practice activity more than halve during the pandemic period.[28]

In contrast, a study performed in a plastic surgery unit in Ireland found no difference in melanoma characteristics, including Breslow thickness and ulceration, between pre-pandemic and pandemic cohorts.[29] That study also reported a statistically significant increase in melanoma diagnoses during the pandemic.[29] The authors credited the swift

reorganisation of services in their unit for their success: the unit set up a telemedicine service for skin cancer triage, and skin cancer surgeries were performed in non-COVID-19 provider centres and private hospitals.[29]

It is difficult to extrapolate overseas findings to Australia, because melanoma incidence and management vary widely. For example, the melanoma management pathway in Ireland is far less reliant on general practice. Over a 10-year period, only 8.5% of excisional biopsies in Ireland were performed in primary care, with the remainder performed by a specialist in a hospital setting.[30]

We found no significant differences in tumour characteristics before and after the onset of the pandemic. This is likely because melanoma clinics at Westmead Hospital were not postponed or cancelled. In fact, there were more dedicated melanomas clinics and more time allocated for melanoma excisions, made possible by the cancellation of eczema and psoriasis clinics. The increase in melanoma-related activity is reflected in the decreased waiting time for wide local excision. The time from a referral being made by a GP or private dermatologist to wide local excision at Westmead Hospital decreased by 11 days during the pandemic.

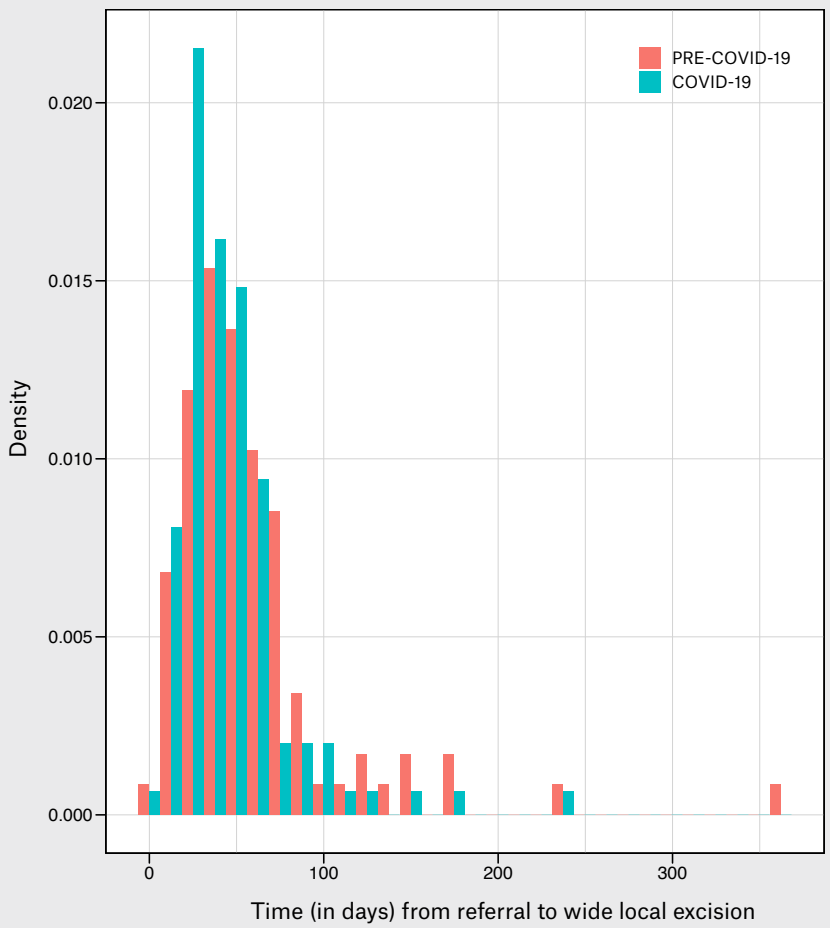

Figure 2. Density plot of duration (in days) from community referral (general practitioner or dermatologist) to wide local excision, before and during the COVID-19 pandemic. Median time from referral to wide local excision decreased during the pandemic (50 vs 39 days; *P*=0.013).

There were no further lockdowns in NSW in 2022, and COVID-19 restrictions were rapidly eased with non-urgent elective surgeries back to pre-pandemic levels by 7 March 2022.[31] The results of the present study show that melanoma care in NSW was not detrimentally affected by COVID-19. Given the extremely poor prognosis of melanomas diagnosed after metastasis,[32] it is a great achievement to have avoided diagnostic delays.

Limitations and opportunities for further research

The main limitation of this study is that the data were taken from a single centre. Another drawback is that tumour staging was not one of our outcomes. Finally, our study is subject to the limitations inherent to a retrospective study. Further research should be conducted in 10 or 20 years to assess any longer-term impacts, and a similar study should be conducted in other Australian states, particularly Victoria, where melanoma diagnosis is known to have been affected by the onset of the pandemic.[15]

Conclusion

In this study, we found no difference in Breslow thickness or rates of ulceration of newly diagnosed melanomas before and after the onset of the pandemic. In fact, we observed reduced waiting times for wide local excision of melanomas diagnosed in the community. The prioritisation of melanoma care during the pandemic at Westmead Hospital (NSW, Australia) has resulted in no apparent delays in diagnosis and treatment, providing a framework for handling future instances of unprecedented healthcare upheaval.

Authors

Meryl Thomas MBBS, Resident Medical Officer, Department of Dermatology, Westmead Hospital, Sydney, NSW

Maria Jones-Caballero MD, FACD, PhD, Consultant Dermatologist, Department of Dermatology, Westmead Hospital, Sydney, NSW; Clinical Senior Lecturer, Sydney Medical School, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW

Marlene Wijaya MD, MPhil, Senior Resident Medical Officer, Department of Dermatology, Westmead Hospital, Sydney, NSW

Pablo Fernandez-Penas MD, PhD, FACD, Head of Department, Department of Dermatology, Westmead Hospital, Sydney, NSW; Professor of Dermatology, Sydney Medical School, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW

Table 3. Clinical data, including cases per month, setting of melanoma diagnosis and referral–biopsy excision intervals, overall and before and during the COVID-19 pandemic separately

	Total	Pre-pandemic period (1 January 2019 – 30 March 2020)	Pandemic period (31 March 2020 – 31 December 2021)	*P* value
No. patients	426	177 (41.5)	249 (58.5)	
Cases per month		11.8±4.5	11.3±4.3	0.745
Lesion detection				0.016
In the community	307 (71.1)	139 (78.5)	168 (67.5)	
Within hospital clinic	119 (27.9)	38 (21.5)	81 (32.5)	
Time from biopsy to referral (days)	176	7.0 [5.0–10.0]	7.0 [5.0–9.0]	0.887
Time from referral to wide local excision (days)	213	50.0 [33.3–69.8]	39.0 [28.0–55.0]	0.013
Time from biopsy to wide local excision (days)	313	48.0 [31.3–70.0]	43.0 [33.5–62.0]	0.239

Unless indicated otherwise, data are given as the mean±SD, median [interquartile range] or n (%).

SD, standard deviation.

Raquel Ruiz Araujo MD, FACD, Consultant Dermatologist, Department of Dermatology, Westmead Hospital, Sydney, NSW; Clinical Senior Lecturer, Sydney Medical School, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW

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Correspondence to:
meryl.thomas1@gmail.com

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correspondence **ajgp@racgp.org.au**

Offering reproductive genetic carrier screening for cystic fibrosis, spinal muscular atrophy and fragile X syndrome: Views of Victorian general practitioners

Ruth Leibowitz, Sharon Lewis, Martin Delatycki, John Massie, Jon Emery, Alison Archibald

Background and objective
The Royal Australian College of General Practice recommends that all women contemplating pregnancy or in early pregnancy should be offered reproductive genetic carrier screening (RGCS). In November 2023, a new Medicare item number was introduced for RGCS to detect cystic fibrosis (CF), spinal muscular atrophy (SMA) and fragile X syndrome (FXS) carrier status. The role of general practice in offering RGCS is recognised as being of crucial importance, but only a minority of general practitioners (GPs) are offering such screening. This study investigates the facilitators and barriers to offering RGCS in general practice.

Methods
Fifteen Victorian GPs who had offered RGCS for CF, SMA and FXS participated in semi-structured telephone interviews. A behavioural change framework was used for this study.

Results
Barriers to offering screening (eg out-of-pocket costs, low frequency of preconception care and lack of GP education) mapped predominantly onto the 'opportunity' domain of the behaviour change framework.

Discussion
Reducing out-of-pocket costs and increasing the provision of preconception care and GP education will provide more people with the opportunity to make informed choices about participation in RGCS.

THE ROYAL AUSTRALIAN College of General Practitioners (RACGP) and the Royal Australia and New Zealand College of Obstetrics and Gynaecology (RANZCOG) recommend that all people contemplating pregnancy or in early pregnancy should be offered information about reproductive genetic carrier screening (RGCS) for at least the more common genetic conditions that affect children (eg cystic fibrosis [CF], fragile X syndrome [FXS], haemoglobinopathies and spinal muscular atrophy [SMA]) regardless of family history or ethnicity.[1,2]

In Australia, RGCS is currently offered by several pathology providers, either as a three-condition screen (CF, FXS and SMA) or as expanded carrier screening (ECS) (testing for hundreds of autosomal recessive and X-linked conditions), with a range of out-of-pocket costs.[3,4] In November 2023 a new Medicare item number was introduced for RGCS to detect CF, SMA and FXS carrier status.[5]

The role of general practice in offering RGCS is recognised by stakeholders as crucially important,[3] but only a minority of general practitioners (GPs) are offering RGCS in Victoria.[6] Although studies have investigated healthcare professionals' role in ECS in Victoria,[7] no study has investigated GPs' views about screening for the conditions for which the new Medicare item number was introduced.

This study aimed to investigate facilitators and barriers to offering RCGS for CF, SMA and FXS in general practice.

Methods

This study explored the views of GPs who have offered a three-condition screen for CF, SMA and FXS carrier status provided by Victorian Clinical Genetic Services (VCGS), a not-for-profit genetic pathology service that is a wholly owned subsidiary of the Murdoch Children's Research Institute (www.mcri.edu.au). This screen is offered through doctors, including GPs and obstetricians. It is the most widely offered RGCS in Victoria.[6] Up until November 2023, patients incurred an out-of-pocket cost of $389 for this screen.

Study design

A qualitative approach using semi-structured interviews of a subset of Victorian GPs offering the screening was undertaken. The study used a descriptive phenomenology outlook, which investigates an area of interest from the perspective of those involved,[8] and behaviour change theory was used as a methodological framework.[9] An interview guide was developed using a behavioural change framework.[9,10] At the centre of the framework is a 'behaviour system' termed the 'COM-B system', which involves three essential conditions: capability, opportunity and motivation. This framework has been used extensively in healthcare research to describe behaviour and to help bring about behaviour change in line with evidence-based practice.[10]

Table 1. Selection and characteristics of participants

	Total number of general practitioners	Invited for an interview	Interviewed
High-frequency requesters (ie >25 requests)	49 (all female)	24 (all female)	9 Sex: all female Location: all metropolitan Maternity qualifications: all shared care
Low-frequency requesters (ie 1 request)	538 (349 female, 189 male)	26 (9 female, 17 male)	6 Sex: 3 male, 3 female Location: 2 regional, 4 metropolitan Maternity qualifications: 1 shared care, 1 general practitioner obstetrician

Researcher characteristics and reflexivity

The interviewer and lead author, RL, is an experienced older Victorian GP who might have had preconceived assumptions about RGCS based on her own experience, attitude and beliefs. Having a GP as an interviewer might have helped with rapport and communication but also might have led to unchallenged, shared assumptions and attitudes, or fellow professionals wanting to present themselves in a certain light to colleagues. Her co-authors, most of whom were not GPs and were experienced in qualitative research, helped by providing guidance regarding qualitative research techniques.

Data collection

A list of GPs who had requested the VCGS three-condition screen was available from the VCGS database. Participant GPs were selected using purposive sampling,[11] based on the frequency with which they had requested the screen for their patients between September 2013 and October 2018. Low-frequency requesters (LFR) were categorised as those GPs who had requested this screen once and high-frequency requesters (HFR) were categorised as those GPs who had requested the screen on more than 25 occasions (top fifth percentile of GPs by frequency of request[6]). Purposive sampling was also used among LFRs to select GPs based on sex and the location of their practice. All HFRs were women and worked in metropolitan areas (Figure 1). Selected GPs were contacted via fax and invited to take part in a telephone interview. Verbal consent was obtained from the participating GP, and the interviews were audio-recorded. Interviewing continued until no new information was emerging from the interviews. Interviewed GPs received a $100 gift voucher. The interviews were undertaken between March 2019 and June 2021. The study duration was longer than expected due to disruptions caused by the SARS-CoV-2 pandemic.

Data processing and analysis

Interviews were transcribed verbatim and subsequently de-identified. Data and coding were managed using NVivo (version 12, Lumivero, 2018). The initial transcripts were coded by one researcher (RL) and then co-coded by two other researchers (AA and SL). Coding differences were discussed and a common coding scheme was created. The subsequent coding was completed by RL, with ongoing discussion among coders. Related codes were organised into themes and then reorganised as an iterative process after discussion among the three coders.[12] Emerging themes were then mapped onto the behavioural framework using the COM-B system.[9]

Results

Selection and characteristics of participants

Of the 860 Victorian GPs who requested the VGCS three-condition screen between September 2013 and October 2018, 587 (68%) were eligible for this study; that is, they were either HFRs or LFRs (Table 1). A total of 24 HFRs (49% of all HFR) and 26 LFRs (5% of all LFRs) were invited for interview. Nine HFRs and six LFRs agreed to participate in an interview. Interviews lasted between 14 and 26 minutes, with a median length of 21 minutes. All HFRs were women, worked in the metropolitan area and provided antenatal shared care. Half the LFRs were men. Two lived in rural locations, one provided shared care and one was a GP obstetrician.

Many of the HFRs described offering the three-condition screen to all women attending for preconception care and all pregnant women. In contrast, the LFRs had not incorporated this screening into their regular care. Among the six LFRs, two described how they were increasingly offering RGCS as they became more familiar with it, two commented that they only offer it to women before pregnancy but do not see many women in this category, and two GPs had only requested the test when requested by a patient.

Mapping themes onto the COM-B system

Themes that predominantly map onto the 'motivation' domain

Positive attitude to the concept of offering the three-condition RGCS and viewing general practice as the most appropriate place for RGCS to be offered

Both HFRs and LFRs expressed broadly positive attitudes to the concept of offering the three-condition screen and agreed that general practice is the most appropriate place for this screen to be offered (Figure 1).

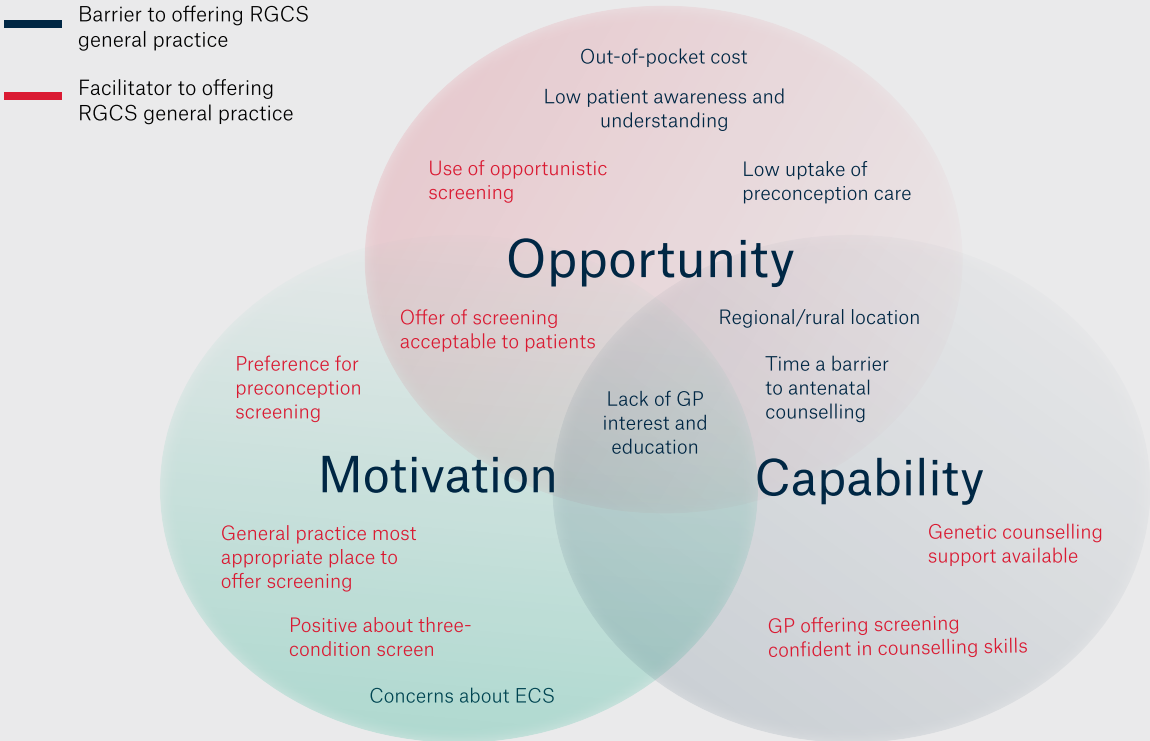

Figure 1. Facilitators and barriers to offering RGCS in general practice mapped onto the COM-B system.[9]
ECS, expanded carrier screening; GP, general practitioner; RGCS, reproductive generic carrier screening

Reasons given were that GPs know their patients best, they see women/couples prior to pregnancy, they are the first healthcare professional to see pregnant women and they are often the only healthcare professional women see in the first trimester of their pregnancy:

> *We* (GPs) *are the ones who see the people in the beginning of their pregnancy and also pre-pregnancy … I can't imagine where else they are going to find out about it.* (Helen, HFR)

Concerns about ECS

In contrast to their attitude to the three-condition screen, many of the GPs expressed concern about counselling for ECS (with hundreds of autosomal recessive and X-linked conditions screened for from one sample). They acknowledged their lack of knowledge about many of the conditions included in the ECS and questioned whether screening for so many conditions is beneficial to the patient:

> *I really have no sense of the broader panels of testing … And what sort of can of worms that opens up.* (Vera, HFR)

> *I'm quite comfortable about the short panel, but when they start talking about the extended ones … what does it actually mean?* (Bob, LFR)

Preference for preconception screening over antenatal screening

GPs were all in agreement that offering screening before pregnancy is preferable to offering screening during pregnancy. Patient anxiety and time constraints for GPs are seen as more problematic when offering screening during pregnancy compared to before pregnancy:

> *In those first few visits* (in pregnancy), *you're pretty time poor and the rush to get through as much as possible in that visit.* (Simon, LFR)

> *Early pregnancy* (screening) *is OK, but it leads to the issue, as has happened to me once before, where a test comes back positive and mum is already 9–10 weeks pregnant and dad is frantically having his test done, and everyone is a bit on edge waiting to see what happens.* (Susan, HFR)

The offer of RGCS is acceptable to patients even if they decide against screening

GPs reported that women are broadly positive about being offered screening and that those women who choose not to take up screening do not express concerns about being offered screening. They stated that a common response among women choosing not to take up screening is that a positive result would not affect their future behaviour:

> *I've not had anyone be hostile, but they* (say) *'I'm just not interested in doing it' or 'I wouldn't act on it if I had a child that was affected by disease, so that's not for me'.* (Anne, HFR)

Themes that predominantly map onto the 'capacity' domain

Confident in ability to undertake pre-test counselling for the three-condition screen

Despite differences in frequency of screening, all the GPs felt confident in their ability to undertake appropriate pre-test counselling for the three-condition screen. LFR GPs felt that even if they are not across all the details of the screening offered, they are able to explain basic concepts and direct the patient to the relevant written information for more details. A parallel between the skills required for offering non-invasive prenatal testing (NIPT) and those required for offering RGCS was postulated by some interviewees:

> *Yeah, I feel skilled enough to talk about what's on offer. Probably not so much about the actual details, you know the sensitivity and specificity of the test, but enough to explain what's on offer, what we're looking for in terms of CF and FX*S. (Simon, LFR)

> *Yes, I think so. I have a good understanding of the genetics of cystic fibrosis, not so much the fragile X and the spinal muscular atrophy … I don't think I need to know more about the details of those for my role in offering the test.* (Helen, HFR)

> *In many ways, I'm always talking about something similar when I'm talking about the NIPT as well.* (Bob, LFR)

GPs all described using written information (ie brochures/information sheets and/or directing patients to online websites) as part of the counselling process. Involving the patient's partner in decision-making was acknowledged as important. The GPs offering screening described how the process became easier with time.

Presenting information about RGCS but not influencing the patient and allowing them to decide was seen as very important:

> *I don't suggest that they do or don't; I just give them the information so that they can decide for themselves … And really whether they decide to or not is not really my business.* (Anne, HFR)

Level of GP knowledge and interest in reproductive medicine is a major factor in frequency of offering screening

Lack of awareness and education around RGCS were mentioned as common reasons why many GPs are not offering screening. Personal preferences of GPs for particular areas of medical practice were seen to play a role in differences in frequency of offering RGCS:

> *It's another thing GPs should do, and for some GPs, it's not that important to them. Maybe it's not going to be high on their list of priorities.* (Sally, LFR)

> *There's a lot of GPs whose focus is on skin or diabetes or heart disease, who really don't have the knowledge that would be required to do it properly.* (Anne, HFR)

Level of genetic counselling support offered by pathology affects GP confidence in offering screening.

The importance of support from the pathology provider for follow-up genetic counselling services was expressed by many GPs and guided their choice of pathology provider.

Themes that predominantly map onto the 'opportunity' domain

Socioeconomic and educational status of patient affects access

There was universal agreement among the GPs that the out-of-pocket cost of RCGS is a major barrier to uptake of screening, and some felt uncomfortable offering an expensive test to women who might not be able to afford it. Several GPs mentioned the desirability of screening being government funded. Counselling women was noted to be easier and quicker when patients are from a well-educated demographic:

> *It's a fairly knowledgeable patient base that I see anyway. You're probably starting already from the half-way point.* (Susan, HFR)

> *… to explain something like genetic testing to someone whose English is a second language or who hasn't gone to school, … in particular locations of general practice and in particular demographics; this kind of stuff is boutique medicine, really. I can understand why a GP just wouldn't even have a conversation about a $400 test for a patient that, you know, is just living from week to week.* (Anne, HFR)

Rural/regional location could make follow-up more difficult and increase costs

Concerns about potential delays in follow-up and incremental costs were aired as potential problems for rural and regional patients:

> *I do worry, once we get a result, that that person is adequately counselled around the result and that we've got access to genetic counsellors quickly. In the past, it's been difficult because access is usually going to Melbourne, and it's a struggle for some families, just the escalation in cost. So, I certainly think these things might be a bit of a barrier to me opening up a Pandora's box.* (Bob, LFR)

Variation in time taken for pre-test counselling

There were a variety of opinions about the time required to provide adequate pre-test counselling. The importance of taking time to counsel the patient thoroughly was raised by some. Others felt that a long discussion is unnecessary and undertake only brief counselling with their patients:

> *Well, it's obviously quite complicated, and so I want to make sure they understand it all beforehand, so it's not particularly quick.* (Jenny, LFR)

> *I give them brief counselling because there is never time for too much* (laugh) *… general practice is not the place to go into detail.* (Helen, HFR)

Time constraints and competing priorities emerged as a larger barrier to offering screening in early pregnancy compared with preconception counselling.

Level of awareness and understanding of RGCS among patients

GPs reported that women responded less positively to the offer of RGCS compared to screening for chromosomal conditions and ascribed this to lack of familiarity.

Additionally, the conceptual understanding required to assess risk and then understand the options available in the event of a positive result was reported as challenging and off-putting for some patients. Some patients erroneously assumed that that screening is not appropriate where there is no family history of the conditions:

> *They'll say, 'I've always known about having the test for Down syndrome, didn't know about this test', 'my friends didn't have it' or 'I didn't have it in my last pregnancy so I don't think I'll bother this time'.* (Linda, HFR)

> *I often have people say to me, 'Oh, I have none of these conditions in my family, so I don't think I will' ... so I explain that most people* (who) *are found to be carriers don't have family members ... That is a common misunderstanding.* (Helen, HFR)

Variation in uptake of preconception care related to socioeconomic demographic of patients.

A high uptake of preconception care was notable among HFR GPs. In contrast, LFR GPs expressed frustration at the poor uptake of preconception care. HFR GPs ascribed their high uptake of preconception care to the high socioeconomic demographic of their patients. They also described use of opportunistic preconception counselling during other consultations, particularly women's health-related consultations. This approach was seen to work best when there is continuity of care:

> *I often laugh because I get so excited when someone comes in to prepare for pregnancy; it's such a rarity. I usually get, 'Oh my god, I'm pregnant! I need to find a doctor'.* (Simon, LFR)

> *I work in the CBD of Melbourne, so I'm fortunate to work with very motivated, intelligent patients who usually, not always, have a consult before they even try and get pregnant.* (Alice, HFR)

> *Often, I have prompted them to have made that* (preconception) *visit. So, if they indicate that they are contemplating family planning over the next 12–18 months, then I usually say, 'Please come and see me three months before you are planning to actively try'.* (Vera, HFR)

Low level of community education about preconception care

There was recognition that public awareness around the benefits of pregnancy planning is low. Various ways of promoting preconception care were suggested, including use of posters, social media and education in high school:

> *I don't think there is general public awareness about pre-pregnancy check-up. We promote contraception, but we don't promote pregnancy planning as well.* (Carol, HFR)

Summary of findings

Many of the barriers to screening mapped onto the 'opportunity' domain, which includes social influences and environmental context and resources (Figure 1).[10] Using the behaviour change framework wheel at the policy level,[9] changes in fiscal measures (eg government funding), service provision (eg in rural and regional areas) and communication/marketing (eg related to delivery and uptake of preconception counselling) might be measures that lead to a reduction in opportunity barriers. The main barrier in the motivation/capability domain is lack of interest and/or lack of education of GPs in RGCS.

Discussion

This study of GPs' views of RGCS found that major facilitators to GP screening were a positive attitude towards the three-condition RGCS and confidence in counselling skills. Major barriers were cost, low awareness and knowledge about RGCS among many GPs and patients and low provision of preconception care in many GP settings. Many of these findings are similar to those of a study of healthcare professionals offering ECS.[7] Most barriers mapped to the 'opportunity' domain using the behaviour change framework.

The introduction of government funding for CF, FXS and SMA carrier screening has now removed the out-of-pocket cost for this form of RGCS, thus removing one of the major 'opportunity' barriers to offering screening. This will, no doubt, lead to an upsurge of interest by GPs and patients in the three-condition screen. Improving GP awareness and education about RGCS, so that general practice is equipped for this change, is vitally important.

However, some barriers in the 'opportunity' domain of the behaviour change framework will remain, such as the provision and cost of some follow-up tests (currently prenatal testing is available free of charge in the public system, but preimplantation genetic testing is not and is associated with significant out-of-pocket expenses). For couples living in rural or regional areas, access to follow-up for genetic counselling, prenatal testing or in vitro fertilisation with preimplantation genetic testing is a significant barrier to RGCS. Similar barriers to access to screening programs and preconception care have been found in other studies.[13] Additionally, the educational level and cultural and ethnic backgrounds of patients are likely to remain a source of inequity.[14]

The GPs' preference for preconception RGCS over antenatal RGCS is in accordance with the expressed preference for preconception screening among other health professionals and stakeholders.[15] Time constraints in antenatal consultation already crowded with healthcare issues and concern about causing increased anxiety to women at a vulnerable time in their lives are issues highlighted in this study and also described in the literature.[16] Additionally, it is well recognised that preconception screening increases the reproductive choices for women found to be at increased risk by screening.[3] Despite this strong preference for offering screening before pregnancy, studies have shown that most RGCS requested by GPs are in early pregnancy.[6] The frustration expressed in this study at the poor uptake of preconception care in general practice mirrors findings from other studies.[13,17] Offering RGCS as part of a holistic GP preconception care consultation provides a model by which GPs could incorporate RGCS into their practice.[3] There is strong evidence for the benefits of preconception care in general practice for improving pregnancy outcomes.[18,19] The RACGP's 'Guidelines for preventive activities in general practice' (Red Book) outline evidence-based recommendations covering such items

as immunisation status, previous adverse pregnancy outcomes and patient lifestyle.[20] A new updated version is planned that will include recommendations for RGCS that are consistent with those of RANZCOG.

The lack of public health education about planning for pregnancy compared with other areas of health promotion, noted by the GPs in this study, is in line with many studies that have shown that women of reproductive age demonstrate low levels of knowledge and behaviour related to preconception care.[21,22] Raising awareness of the importance of preconception care in the community should be a priority. There are multiple Medicare Benefits Schedule (MBS) item numbers used in general practice to promote public health and preventative health measures. In view of the strong evidence for the benefits of preconception care in general practice for improving pregnancy outcomes[18,19] and the advantages of offering RGCS before pregnancy, the introduction of the MBS item number for RGCS might prompt consideration of the public health benefits of introducing an item number for preconception care.

GPs in this study placed emphasis on being non-directive when offering screening, seeing their role as giving patients information and allowing the patient to come to their own decision about proceeding with screening. This approach aligns with the concept of reproductive autonomy for the patient.[3] As RGCS becomes more common, it is important that GPs continue to respect reproductive autonomy and are vigilant to avoid 'routinisation' when offering RGCS.[23]

The misgivings expressed in this study about ECS burdening patients with information about their status as carriers of multiple rare genetic conditions might be unfounded if couples-based screening (where only couples who both carry a mutation for the same condition are notified) is used.[24] Outcomes from the prospective study Mackenzie's Mission,[25] which offered couples-based screening, will help further clarify the acceptability of ECS with couples-based screening.

Limitations

Focusing only on GPs who have had experience of offering RGCS limits this study's generalisability, as GPs who offer RGCS are still a minority in the state of Victoria.[6] 'Early adopters' might have a more favourable attitude to RGCS than GPs not presently engaging in RGCS. Additionally, views of GPs might have changed since the completion of these interviews. Both the availability of the interviewer and recruitment of GPs was affected by the change in priorities in general practice over the SARS-CoV-2 pandemic.

Conclusion

In conclusion, undertaking changes that address the 'opportunity' domain of the behaviour change framework, particularly reducing out-of-pocket costs, delivering preconception care and improving GP education around RGCS, will provide more people with the opportunity to make informed choices about participation in RGCS.

Authors

Ruth Leibowitz BMBS, FRACGP, MMed, General Practitioner; Department of General Practice, University of Melbourne, Melbourne, Vic

Sharon Lewis BSc, Grad Dip Genet Counsel, MPH, PhD, Senior Research Officer, Murdoch Children's Research Institute, Melbourne, Vic

Martin Delatycki FRACP, PhD, Medical Director, Victorian Clinical Genetics Services, Melbourne, Vic; Co-Director, Bruce Lefroy Centre for Genetic Health Research, Murdoch Children's Research Institute, Melbourne, Vic; Professor of Clinical Genetics, Department of Paediatrics, University of Melbourne, Melbourne, Vic

John Massie MBBS, FRACP, PhD, Clinical Associate Professor, Department of Respiratory Medicine, Royal Children's Hospital, Melbourne, Vic; Clinical Director, Children's Bioethics Centre, Melbourne, Vic; Professor, Department of Paediatrics, Royal Children's Hospital, University of Melbourne, Murdoch Children's Research Institute, Melbourne, Vic

Jon Emery MA, MBBCh, MRCGP, FRACGP, DPhil, Director, Primary Care Collaborative Cancer Clinical Trials Group (PC4), Herman Professor of Primary Care Cancer Research, Department of General Practice and Centre for Cancer Research, The University of Melbourne, Melbourne, Vic

Alison Archibald PhD, GDipGenetCouns, Honorary Principal Fellow, Department of Paediatrics, University of Melbourne, Melbourne, Vic; Associate Professor, Head of Service Development, Reproductive Genetics and Group Leader – Reproductive Genetic Counselling, Victorian Clinical Genetics Services, Murdoch Children's Research Institute, Melbourne, Vic

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Correspondence to:
r.leibowitz@icloud.com

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correspondence **ajgp@racgp.org.au**

Burnout and retention of general practice supervisors: Prevalence, risk factors and self-care

Samia R Toukhsati, Rebecca Kippen, Carla Taylor

Background and objective
Burnout is common in primary care doctors. The aim of this study was to explore burnout, self-care and retention in general practice supervision in Australia.

Methods
The sample comprised 267 general practice supervisors from all Australian states and territories. Respondents completed an anonymous online survey.

Results
Respondents reported high levels of disengagement (n=189; 71%) and exhaustion (n=212; 79%). Factors associated with burnout included being younger; working while unwell; holding the belief that workplace support for self-care was inadequate; and lower daily balance and/or professional development self-care. Exhaustion was negatively associated with general practice supervisor retention via its negative effect on self-care (β=−0.379; 95% CI: −0.777 to -0.050).

Discussion
Burnout is common in general practice supervisors and is associated with attrition, possibly via a negative effect on self-care. Greater investment in workplace initiatives to address burnout and sector-wide strategies to reduce workforce shortages are needed.

BURNOUT is common in general practitioners (GPs) worldwide[1] to the point of being normalised as it reaches crisis point.[2] Burnout is an 'occupational phenomenon', caused by persistent and unrelenting workplace demands and unattainable goals.[3] Burnout is generally described as comprising overwhelming feelings of exhaustion, disengagement and poor performance efficacy[3] that occurs in GPs when one's 'wellbeing reservoir' is depleted.[4]

Prior to COVID-19, burnout had already reached 'global epidemic levels',[5] with up to one in every three doctors at high risk of, or already experiencing, burnout.[6,7] The risk of burnout has been further exacerbated by the recent pandemic and unprecedented natural disasters, especially for frontline service workers.[8,9] Most recently, The Royal Australian College of General Practitioners' (RACGP) 2023 Health of the Nation report, which surveyed over 2000 practising GPs in Australia, found that 71% reported having experienced burnout in the past 12 months in their role as a GP.[10]

Although it is not a clinical disorder per se, burnout in health practitioners is associated with poor mental health,[11] including higher rates of suicide ideation[8] and poor physical health,[12] as well as low job satisfaction and high intentions to leave.[11] Moreover, alongside significant personal and professional consequences, burnout has been linked to reduced quality of patient care.[11,13]

To date, initiatives to reduce burnout tend to focus on fostering resilience in individuals, such as practising self-care, but with limited effect. For example, a recent randomised controlled trial in over 2000 National Health Service staff in the UK found a significant improvement, albeit with small effects, of the Headspace self-care digital phone app on stress (95% confidence interval [CI]: −0.47 to −0.14) depression (95% CI: −0.40 to −0.08) and anxiety (95% CI: −0.32 to −0.06), but not burnout, compared with an active control (Moodzone).[14] Other research has argued that mindfulness interventions designed to tackle burnout and other work-related stressors must be contextualised within a supportive organisational environment to achieve benefits.[15]

This is aligned with recent calls for systems and government responses to address the workplace and workforce shortage problems associated with burnout.[16] Only 13% of medical graduates are choosing to specialise in general practice, representing a 30% reduction in the past five years, heralding a significant workforce shortfall by 2030.[17] Moreover, burnout has been linked to accelerating workforce attrition in general practice, which threatens the sustainability of primary healthcare in Australia.[10,18]

Retention losses also include general practice supervisors, with up to one-third of the supervision workforce intending to leave supervision within the next few years.[19] General practice supervisors are the cornerstone of GP vocational training, overseeing the training of several thousand GP registrars annually, hosted in general practices across the country.[20] Losses in those willing to supervise raise questions about the future sustainability of GP training

in Australia. Research is needed to explore the prevalence of burnout in general practice supervisors, their engagement in self-care practices and risk factors associated with general practice supervisor attrition.

The aim of this exploratory study was to advance understanding of burnout and self-care practices in general practice supervisors in Australia and their intentions to remain in general practice supervision.

Methods

This was a cross-sectional study. Invitations to participate in General Practice Supervision Australia's (GPSA) online anonymous annual national supervision survey were emailed to GPSA members and advertised in social media and GPSA's E-News in March–April 2022.

Burnout was indexed using the 16-item Oldenburg Burnout Inventory (OBI),[21] to which respondents indicate their agreement with items using a scale from 1 (strongly disagree) to 4 (strongly agree). The OBI comprises two burnout dimensions: Disengagement, referring to negative attitudes towards one's work; and Exhaustion, arising from prolonged exposure to physical, affective and cognitive strain.[21] Following reverse scoring of eight negatively phrased items, items were summed to generate mean 'Disengagement' and 'Exhaustion' scores, as well as a 'Total Burnout' score, ranging from 1 to 4, with higher scores indicating higher levels of burnout. Suggested cut-off scores established in Swiss healthcare workers were applied here, namely >2.1 for Disengagement and >2.25 for Exhaustion.[22] The OBI has good psychometric properties.[23]

Self-care was measured using the Self-care Assessment for Psychologists (SCAP),[24] which has relevance to other health professions. The SCAP comprises five self-care dimensions: Professional Support (eg avoiding workplace isolation); Professional Development (eg maximising time in enjoyable professional activities); Life Balance (eg spending time with family or friends); Cognitive Awareness (eg being mindful of triggers that increase professional stress); and Daily Balance (eg taking some time for relaxation each day). Higher scores in each self-care domain indicate higher levels of engagement in self-care. The SCAP has good psychometric properties.[24]

The Primary Healthcare Practitioner self-care survey[25] was used to address respondents' workplace self-care, such as the amount of annual/personal/sick/mental health leave taken in the past 12 months.

Data were exported from SurveyMonkey and imported into IBM SPSS Statistics V.28. In all, 290 general practice supervisors commenced the survey. Little's Missing Completely at Random test confirmed that missing OBI and SCAP data were missing completely at random (χ^2_{383}=427.25, P=0.059). Expectation maximisation, which provides an unbiased algorithm for predicting missing values, was used to input missing data for participants with <20% missing SCAP data (n=7) and <20% missing OBI data (n=5). Respondents with 100% missing OBI and SCAP data were removed (n=23; <10% of the sample), with the final sample comprising 267 respondents. Two outliers (defined as scores ±3.29 standard deviations [SD]) were identified (OBI: Disengagement and SCAP: Professional Support) across two separate respondents. Inspection of the boxplots identified these as mild outliers and, given that they were within ±3.5 SD, they were not transformed. Hierarchical multiple linear regression (HMLR) analyses were used to explore predictors of Disengagement and Exhaustion; all assumptions were met. Logistic regression analyses were used to explore predictors of general practice supervision attrition. The assumptions of minimum frequencies (>five cases per level of each variable) and goodness of fit (Hosmer and Lemeshow, P>0.05) were met. The standardised residuals of five cases exceeded ±2, but the total number are <5% of total cases. The assumption of logit linearity was violated for one continuous predictor (SCAP: Professional Support), which was removed from the model.

Ethics approval to conduct the study was granted in February 2022 by the Monash University Human Research Ethics Committee (#19442).

Results

Of the 4464 supervisors invited to participate via email, 267 completed the surveys. Sociodemographic and professional factors are presented in Table 1.

Primary health self-care

Of the respondents, 21% (n=56) do not have their own GP and 41.6% (n=111) had worked in the past 12 months while physically or mentally unwell. Most respondents had taken annual leave in the past 12 months (n=247; 92.5%), and almost half had taken personal/sick leave (n=128; 46.1%). Over 10% of respondents had taken leave in the past 12 months for mental illness/stress or burnout (n=33; 12.5%) and almost 60% felt that their self-care/wellbeing could be supported better in their workplace (n=138; 58%).

Self-care

Internal consistency across the five SCAP dimensions was good to excellent (Cronbach's α=0.79–0.84). In general, average self-care subscale scores suggest relatively high levels of self-care (mean >4.00), except for Daily Balance self-care, which was low (mean [±SD] 3.79±1.56). Up to 12% of the sample (n=33) had low self-care scores on one or more self-care dimensions, relative to mean self-care subscale scores (low score ≤1.5 SD from the mean).

Burnout

Internal consistency across the Burnout dimensions was good to excellent (Cronbach's α=0.77–0.89). The majority of the sample had high levels of Disengagement (score ≥2.1; n=189; 71%) and Exhaustion (score ≥2.25; n=212; 79.4%), with mean scores exceeding published cut-off points.[22] The mean score for Exhaustion was significantly higher than that for Disengagement (2.59±0.55 versus 2.29±0.48, respectively; t_{266}= −12.26, P<0.001). There were no differences in burnout scores according to gender or practice location (metropolitan versus regional, rural and remote).

Predicting burnout

Exhaustion

An HMLR analysis found that 42% of the variance in exhaustion was explained by several sociodemographic, workplace and self-care factors ($F_{12,219}$=14.31, P<0.001). As indicated in Table 2, general practice supervisors who were younger, those who had worked while physically/mentally unwell in the past 12 months, who held the belief that their self-care could be supported better in the workplace, and those who had lower

Table 1. Characteristics of study participants

Factor	Category	n	%
Age (years)	<45	36	13.5
	45–54	75	28.1
	55–64	104	39.0
	≥65	51	19.1
	Prefer not to say	1	0.4
Gender identity	Women	122	46.2
	Men	142	53.8
Diversity	Aboriginal/Torres Strait Islander	2	0.7
	LGBTQIA+ community	9	3.4
	Live with a disability	9	3.4
	Culturally and linguistically diverse	56	21.0
State/territory location of main training practice	NSW and ACT	83	31.1
	Victoria	67	25.1
	Queensland	55	20.6
	SA	20	7.5
	WA	19	7.1
	Tasmania	17	6.4
	NT	6	2.2
Region	Metropolitan	119	44.7
	Non-metropolitan	147	55.3
Description of main training practice	Community general practice	235	88.3
	State-funded health service	8	3.0
	ACCHO	14	5.3
	N/A	2	0.8
	Other	7	2.6

Table continued on the next page

engagement in daily balance self-care, had significantly higher levels of exhaustion.

Disengagement

A second HMLR analysis found that 30% of the variance in disengagement was explained by sociodemographic, workplace and self-care factors ($F_{12,219}$=8.80, P<0.001). As indicated in Table 2, general practice supervisors who were younger, had worked while physically/mentally unwell in the past 12 months, and those who had lower engagement in professional development self-care, had significantly higher levels of disengagement.

Predicting general practice supervisor retention

A logistic regression model found that 36% of the variance in retention was explained by sociodemographic factors and burnout (χ^2 [13, n=215]=67.53, P<0.001). Older general practice supervisors (odds ratio [OR] 0.276; 95% CI: 0.181–0.422), those who had taken leave for mental illness, stress or burnout in the past 12 months (OR 0.345; 95% CI: 0.125–0.952) and those who had higher levels of disengagement (OR 0.235; 95% CI: 0.085–0.650) were less likely to continue supervising (Table 3).

Self-care was independently and atemporally associated with retention, after accounting for exhaustion, age and working when unwell (b=–0.379; 95% CI: –0.777 to –0.050; Figure 1). These results implicate self-care in shared relationships between exhaustion and retention. There was no significant mediation model for disengagement.

Discussion

This study advances understanding of the prevalence of burnout and self-care practices in general practice supervisors in Australia and explores factors linked to intentions to remain in general practice supervision, during a period of extraordinary circumstance and stress in Australia and internationally. Our survey was conducted in March/April 2022, more than two years after the commencement of the COVID-19 pandemic and with COVID-19 cases and restrictions continuing, along with the identification of long COVID.[26] The finding that over 70% of general practice supervisors had experienced burnout in the past 12 months (specifically disengagement and/or exhaustion) is consistent with the rates reported in the RACGP's 2023 Health of the Nation report (survey conducted April/May 2023).[10] The rates reported here are within the upper range of prevalence estimates reported in large-scale meta-analyses involving physicians.[6] Nonetheless, our findings confirm previous reports of high rates of burnout in general practice[10] and extend these specifically to general practice supervisors who had worked through two years of the COVID-19 pandemic at the time of the survey.

Findings from this study also identified risk factors for burnout, showing that younger general practice supervisors and those who worked when they deemed themselves tohave been physically or mentally unwell were more likely to have higher levels of disengagement

Table 1. Characteristics of study participants (cont'd)

Factor	Category	n	%
Role (as many as apply)	General practice supervisor	267	100.0
	Medical educator	55	20.6
	GP (principal, partner or practice owner)	135	50.6
	GP as employee	54	20.2
	Practice manager	8	3.0
	GP (sole trader/non-employee)	47	17.6
	Other	10	3.7
College membership (as many as apply)	RACGP	244	91.4
	ACRRM	48	18.0
	N/A	5	1.9
	Other	6	2.2
No. GPs in main training practice	1–5	90	33.8
	6–10	104	39.1
	≥11	72	27.1
General practice supervision experience (years)	<2	22	8.2
	2–5	58	21.7
	6–10	62	23.2
	11–20	62	23.2
	≥21	63	23.6
General practice supervision – intention to continue	For the next 5 years	143	53.6
	Will stop within the next 5 years	83	31.1
	Not supervising in the future	12	4.5
	Unsure	29	10.9

ACCHO, Aboriginal Community Controlled Health Organisation; ACT, Australian Capital Territory; ACRRM, Australian College of Rural and Remote Medicine; GP, general practitioner; LGBTQIA+, lesbian, gay, bisexual, transgender, intersex, queer/questioning, asexual; N/A, not applicable; NSW, New South Wales; NT, Northern Territory; RACGP, The Royal Australian College of General Practitioners; SA, South Australia; WA, Western Australia.

and/or exhaustion. The belief that one's self-care is not sufficiently supported in the workplace, as well as poor engagement in daily balance (eg taking breaks throughout the workday) and professional development (eg maximising time in enjoyable professional activities) self-care activities also predicted higher levels of burnout. Given the clear workplace context of these predictors, organisational strategies that empower and support general practice supervisors to set healthy workplace boundaries may go some way towards addressing these issues.

There are several tools and guidelines available to support mental health and wellbeing in the workplace, with recent evidence-informed guidelines recommended to support GP registrars involved in Australian general practice training.[27] For example, in Australia, Heads Up and Beyond Blue have partnered to develop a 'how-to guide for health services' to '[develop] a workplace mental health strategy'.[28] Systems and policy-based strategies that foster 'value fulfilment'[29] and workplace resilience through 'compassion-centred leadership' may offer a proactive, authentic means by which to build a supportive organisational culture and prevent future burnout.[14]

Although our cross-sectional study design precludes causal inferences, mediation modelling supports atemporal associations between exhaustion, self-care and general practice supervisor retention. Future longitudinal research that unravels the causal effects of self-care on burnout, or vice versa, and general practice supervisor retention appears warranted. In addition, further research is needed to monitor the mental health and wellbeing of general practice supervisors, given the easing of COVID-19 restrictions, to determine whether measures of disengagement and exhaustion remain high, perhaps due to continuing cumulative impacts of the pandemic.

Limitations

Participation rates in this cross-sectional study were lower than expected (<10% of the general practice supervision workforce), consistent with falling rates of GP research participation reported elsewhere.[30] The possibility that the results represent a selection bias preferencing those more affected by burnout seems unlikely, given that the findings reported here are consistent with those of past research,[10] suggesting that they are likely to be broadly generalisable to GPs practising in Australia.

Conclusion

Findings from this study confirm that the high levels of burnout seen in primary care doctors around the world extend to those involved in GP training, with younger general practice supervisors at higher risk. Most general practice supervisors felt that their wellbeing and self-care could be supported better in their workplace. Workplace initiatives that support healthy self-care practices, such as setting boundaries and engaging in meaningful professional development activities, may help address the wellbeing crisis in general practice. Given that

Table 2. Hierarchical linear multiple regression predicting exhaustion and disengagement

Outcome	Predictor	b	SE	β	*P* value	95% CI
Exhaustion	Age	−0.064	.030	−0.111	0.036	−0.124, −0.004
	Working while unwell	0.295	0.062	0.267	<0.001	0.172, 0.418
	Self-care workplace support	0.131	0.060	0.119	0.030	0.013, 0.250
	Daily balance	−0.062	0.023	−0.176	0.009	−0.108, −0.016
Disengagement	Age	−0.073	0.029	−0.144	0.013	−0.131, −0.015
	Working while unwell	0.179	0.060	0.185	0.003	0.061, 0.298
	Professional development	−0.116	0.043	−0.264	0.007	−0.201, −0.032

CI, confidence interval; SE, standard error.

Table 3. Logistic regression model predicting general practice supervisor retention

Variable	B	SE	Wald	*P* value	Exp(B)	95% CI
Age	−1.286	0.215	35.655	<0.001	0.276	0.181–0.422
Mental illness leave	−1.066	0.519	4.220	0.040	0.345	0.125–0.952
Disengagement	−1.448	0.519	7.771	0.005	0.235	0.085–0.650

CI, confidence interval; SE, standard error.

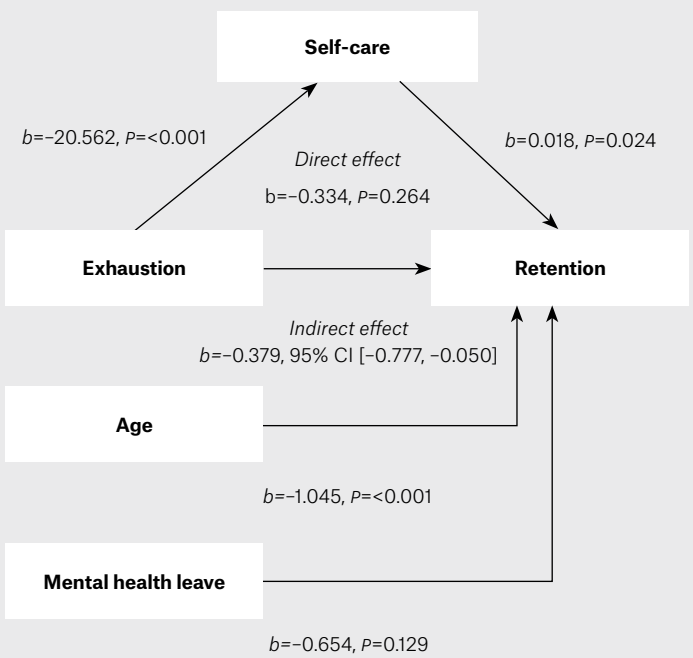

Figure 1. Binary logistic mediation model of burnout as a predictor of retention, mediated by self-care, adjusted for covariates.

general practice supervisors experiencing disengagement were more likely to intend to leave supervision, urgent government investment that simultaneously addresses workforce shortages and minimises the burdens on training practices to encourage greater organisational focus on workforce wellbeing and satisfaction is needed to attract and retain Australian general practice supervisors.

Authors

Samia R Toukhsati BA, BSc (Hons), PhD, Director of Research and Policy, General Practice Supervision Australia (GPSA), Melbourne, Vic; Honorary Principal Fellow, The University of Melbourne, Faculty of Medicine, Dentistry and Health Sciences, Melbourne, Vic; Adjunct Associate Professor (Research), Monash University, School of Rural Health, Bendigo, Vic

Rebecca Kippen BBus, GradDipDemog, PhD, Associate Professor of Demography, Monash University, School of Rural Health, Bendigo, Vic

Carla Taylor BA (Hons), MBA (Int), MComm, CEO, GPSA, Melbourne, Vic; Honorary Research Fellow, Monash University, School of Rural Health, Bendigo, Vic

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Correspondence to:
research@gpsa.org.au

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Patient digital self-screening tool for familial hypercholesterolaemia: A pilot study

Stephanie Eid, Katrina Giskes, Donna Jeong, Luke Jennings, Edward Dababneh, Margot Woods, Charlotte Hespe

Background and objective
Familial hypercholesterolaemia (FH) is a genetic condition contributing to premature cardiovascular disease. Currently, general practitioners (GPs) do not proactively screen for the condition. This study implemented and evaluated a digital FH self-screening questionnaire administered in general practice.

Methods
Patients aged 18–60 years in four general practices were sent an FH screening questionnaire via SMS prior to their GP appointment. The survey identified at-risk patients, and results were exported to the patients' electronic medical record.

Results
In all, 1258 patients were sent the survey; 234 (18.6%) interacted with it, 137 completed self-screening and nine patients were identified as high risk. Self-screening took 3.5 minutes (on average) and was positively evaluated by patients.

Discussion
This proof-of-concept study identified that FH self-screening can be implemented, but further refinements to the self-screening method and interface might be required for greater patient engagement. FH self-screening has the potential to increase FH detection and reduce preventable cardiovascular disease.

FAMILIAL hypercholesterolaemia (FH) is a genetic disorder affecting 1 in 250 people and contributes to premature cardiovascular disease (CVD).[1] Failure to diagnose FH before middle age can result in up to 50% of affected males and 30% of affected females developing premature ischaemic heart disease.[2] However, patients can achieve an average life expectancy if FH is detected and treated early.[2] Treatment involves lifestyle interventions, management of other comorbidities and lifelong cholesterol-lowering medication. FH is largely underdiagnosed in Australia, with more than 90% of cases undetected.[3,4]

General practitioners (GPs) are optimally placed to screen for FH,[5] and screening has been shown to be cost-effective.[6] A thorough health and family history is central to establishing risk. However, GPs are often time-constrained and miss recording essential family history data in the patient record.[7,8] Patients at risk might also not have a long-term GP to provide continuity of care, and therefore evolving strong familial risk might not be identified.[9] A clinical diagnosis of FH can be made based on the Dutch Lipid Clinic Network Criteria, an algorithm focusing on family history, physical examination and low-density lipoprotein (LDL) levels. A recent Australian study by Brett et al extracted data from 15 practices containing 200,000 patients and identified 147 previously undetected cases of FH.[10] This is likely an underestimation, because research has shown missing CVD risk factor data in >50% in patient electronic medical records (eMRs) in general practice,[11] and family history is poorly recorded in the relevant data fields. Furthermore, LDL levels are routinely unavailable for patients aged <45 years because lipid testing is not recommended among the general population for this age group.[12]

This study addressed these limitations by developing, implementing and evaluating a targeted digital FH screening tool using patient self-reporting of medical and family history. This is the first known Australian study trialling an electronic self-screening intervention focused on increasing FH case detection and ultimately reducing the incidence of avoidable CVD.

Methods

Ethics, practice recruitment and consent

Ethics approval was obtained through the University of Notre Dame Australia Human Research Ethics Committee in May 2022 (Reference 2021-165S). General practices were recruited by convenience sampling. Eligible practices needed to use appointment management software programs with text message capacity (eg AutoMed, HotDocs). Each general practice provided written consent for patients to be invited to participate. Data collection took place between June and October 2022.

Patient eligibility, recruitment and consent

The study flow is outlined in Figure 1. Eligible patients were those aged 18–60 years who had a booked face-to-face GP appointment. Patients were prompted to screen by two strategies. First, posters

Table 1. Characteristics of participating practices and their local government areas

	Practice number				
	1	2	3	4	Australian population
Local government area characteristics[A]					
Total population (n)	78,121	182,818	213,845	230,211	25,422,789
Median age (years)	45	38	42	41	38
No. Australian born (% of total)	61,895 (79.2)	114,365 (62.6)	182,826 (85.5)	179,359 (77.9)	17,019,815 (66.9)
No. Aboriginal or Torres Strait Islander (% of total)	2101 (2.7)	2162 (1.2)	11,759 (5.5)	3273 (1.4)	812,728 (3.2)
Median weekly household income ($)	1756	2340	1623	2288	1746
IRSAD[B] (decile)	9	10	7	10	–
RRMA[C] classification	1	1	2	1	–
Practice characteristics					
Time posters displayed (months)	5	5	5	4	–
Total no. responses via poster	13	3	4	11	–
Total no. text messages sent	484	161	264	349	–
Total no. responses via text	80	26	54	44	–

[A]2021 Census data of corresponding local government areas in which practices were located (available from www.abs.gov.au/census/find-census-data/search-by-area).

[B]The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) summarises information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures. Areas in lower deciles are those with greater disadvantage and a lack of advantage. Higher deciles are indicative of areas with a lower disadvantage and greater advantage.

[C]The Rural, Remote and Metropolitan Area (RRMA) classification divides Australia into three zones and seven classes: metropolitan zone (RRMA 1 and 2), rural zone (RRMA 3–5), remote zone (RRMA 6 and 7).

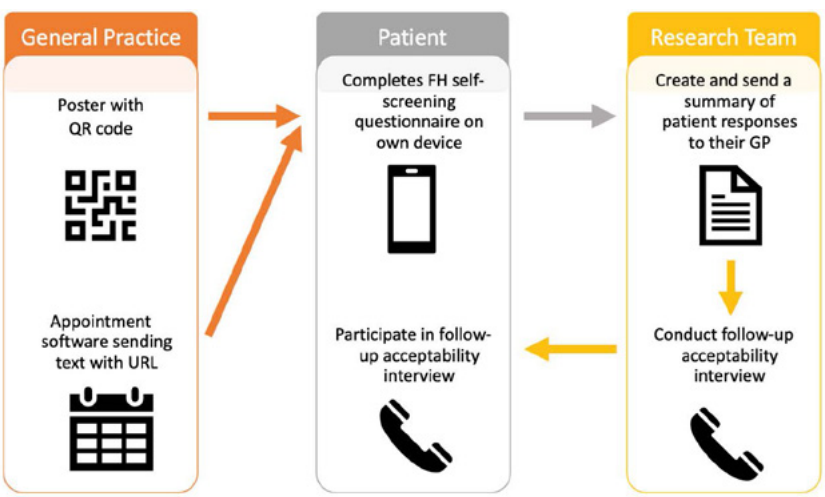

Figure 1. Flow of the familial hypercholesterolaemia (FH) self-screening study.
GP, general practitioner.

advertising FH self-screening were placed in each practice's waiting room and nurses' rooms. These posters contained a QR code that directed patients to the survey. Second, patients who had consented to text message communications with their practice and had a face-to-face GP appointment were sent a text message prompt approximately 48 hours prior to their appointment. This message contained an embedded web link to the survey.

A participation information sheet and consent page were provided when the link was opened. Participants were given the option to provide their contact details and consent for the study team to contact them for a follow-up interview about the screening procedure.

FH self-screening questionnaire

The Dutch Lipid Clinic Network Score (DLCNS) is a validated set of criteria used to determine FH risk. It comprises items

covering personal and family history of CVD, as well as personal and family history of the physical stigmata of hyperlipidaemia.[13] The DLCNS items were adapted to a patient questionnaire format in this study. The items also included images to illustrate some of the physical signs of hyperlipidaemia (eg tendon xanthomata and arcus cornealis).

Integration of patients' screening results into eMRs

On completion of the questionnaire, participants had the opportunity to provide their email address and instantly receive a copy of their responses. Those who provided their details had a summary emailed to their practice. These summaries were then uploaded into their GP's correspondence inbox. Participating GPs were encouraged to review the summary of the FH screening and discuss this with the patient. The management pathway was at the discretion of the treating GP; it was not within the scope of this study to examine further investigations or management that occurred after screening.

Acceptability interview

A short, structured interview guide was developed that explored participants' experiences and acceptability of the self-screening tool. The interview questions were based on the theoretical framework of acceptability and guided by previous healthcare acceptability studies.[14–17]

Participants who consented to follow-up were contacted by telephone. Three researchers conducted the interviews (SE, DJ and LJ), and the interview procedure was standardised across interviewers. Participants were asked to rank the usability of the self-screening tool on a scale from 1 to 5 (1=very difficult; 2=difficult; 3=neutral; 4=easy; 5=very easy). Interviews were voice recorded with patient consent, omitting any identifying details, and were then transcribed verbatim.

Analyses

Basic descriptive statistical analyses (frequencies, percentages, means) were performed on the quantitative results of the self-screening questionnaire using Microsoft Excel. Patient scores were stratified into risk categories based on the DLCNS diagnostic criteria as follows: >3 low risk; 3–5 intermediate risk; 6–8 high risk; and ≥8 very high risk.

Transcripts were stored and coded in NVivo 12, and data analysed using an iterative thematic analysis approach.[18] The analyses used inductive (data-driven) and deductive (research-driven) approaches. SE and ED coded each transcript based on the identification of similar concepts, ideas and patterns in the data and with reference to the key evaluation questions. Once an initial set of codes was derived for each interview question, SE, DJ and LJ grouped these into themes. Rigor was addressed by an iterative process of constant comparison to code and analyse is of the data (moving between codes/emerging themes and transcripts) and continual discussion of emerging themes within the team.

Access to questionnaire and responses

More information on the study's questionnaire, network score and acceptability interview questions are available from the corresponding author on request.

Results

Practice and patient participation

Four practices in the Greater Sydney area participated. Compared with the general Australian population, these practices were in areas with a greater concentration of older, Australian-born and socioeconomically advantaged residents (Table 1).

In all, 1258 text messages were sent to patients. Of the 234 patients who interacted with the FH self-screening questionnaire, 204 (87%) were recruited via the text notification (response rate 16.2%). Of these, 129 provided their demographic information; 93 (72%) were female and the mean age was 45 years (range 20–79 years).

FH self-screening

Figure 2 details the results of screening. In all, 137 participants (10.8% of those sent the text message, and 58.5% of those interacting with the tool) were eligible and completed the questionnaire, 68 (29.1% of non-completers) started but did not complete the items and 29 (12.4% of non-completers) interacted with the tool but were not eligible. Of those who did not complete the items, 57 (83.8%) exited after viewing the participant information, five withdrew before reaching questions about family/personal history and six withdrew at the questions relating to the physical signs. Nine participants were identified to be high risk for FH, and seven of these patients provided their details (two males and five females, age range 34–57 years).

Participant acceptability

Of the 84 participants who consented to an interview, 49 were contactable/available to participate. The average time to complete the self-screening was 3.5 minutes, and all (100%; n=49) found this acceptable. Access to the survey via the text message was rated as 'very easy' by 95% (n=41), with the remainder indicating it was 'easy'. All participants who accessed the survey via the QR code on the poster (n=4; 100%) found accessing the survey 'very easy'. The usability of the survey platform was evaluated as 'very easy' by 93.8%, with the remainder rating it as 'easy'. Four participants required assistance from others to complete the self-screening.

The participant acceptability interviews elicited several themes (Table 2). Overall, the participants found the self-screening process acceptable, raised awareness in their age group and was simple to perform. When asked about barriers to completing the survey, four themes were elicited, as detailed below.

It was very simple/easy

Several commented that they found the self-screening process straightforward, with some stating that the main reason for them participating was because it was simple and easy.

I don't know my family history

Some participants found the family history items difficult to answer because they were estranged from family, were unable to clarify history with deceased family members or health issues were not openly discussed within their family.

Would be better if a medical professional was involved

A few participants commented self-screening might have been easier if it had been completed in the presence of a medical professional. This comment was mostly made regarding the physical examination questions

where participants stated they were unsure if they had tendon xanthomata and arcus cornealis.

The elderly may not be confident with technology

Although not identified as an issue for themselves, a couple of participants were concerned that self-screening might be difficult for older people due to them being less confident with technology.

When asked about why they participated in self-screening, four main themes were identified, as detailed below.

Wanting to contribute to research

Many commented that they enjoy participating in research or view research as important. Some identified that this came from having family members who are part of the scientific or medical community, and others offered this as a way they could contribute to the progression of science.

Concerned about my own risk

Many participants stated that concerns for their health were a motivating factor to undertake screening. For some, this concern stemmed from their medical history, such as elevated cholesterol, whereas for others, this came from awareness of family with heart disease. Some participants identified their age or parental responsibilities as the reason(s) for being concerned about their health.

I like/trust my GP

A number of participants stated they undertook self-screening because it was connected directly to their trusted GP. Some commented that this made the text message recruitment modality more trustworthy.

Boredom

A few participants stated that they took part in the self-screening out of boredom.

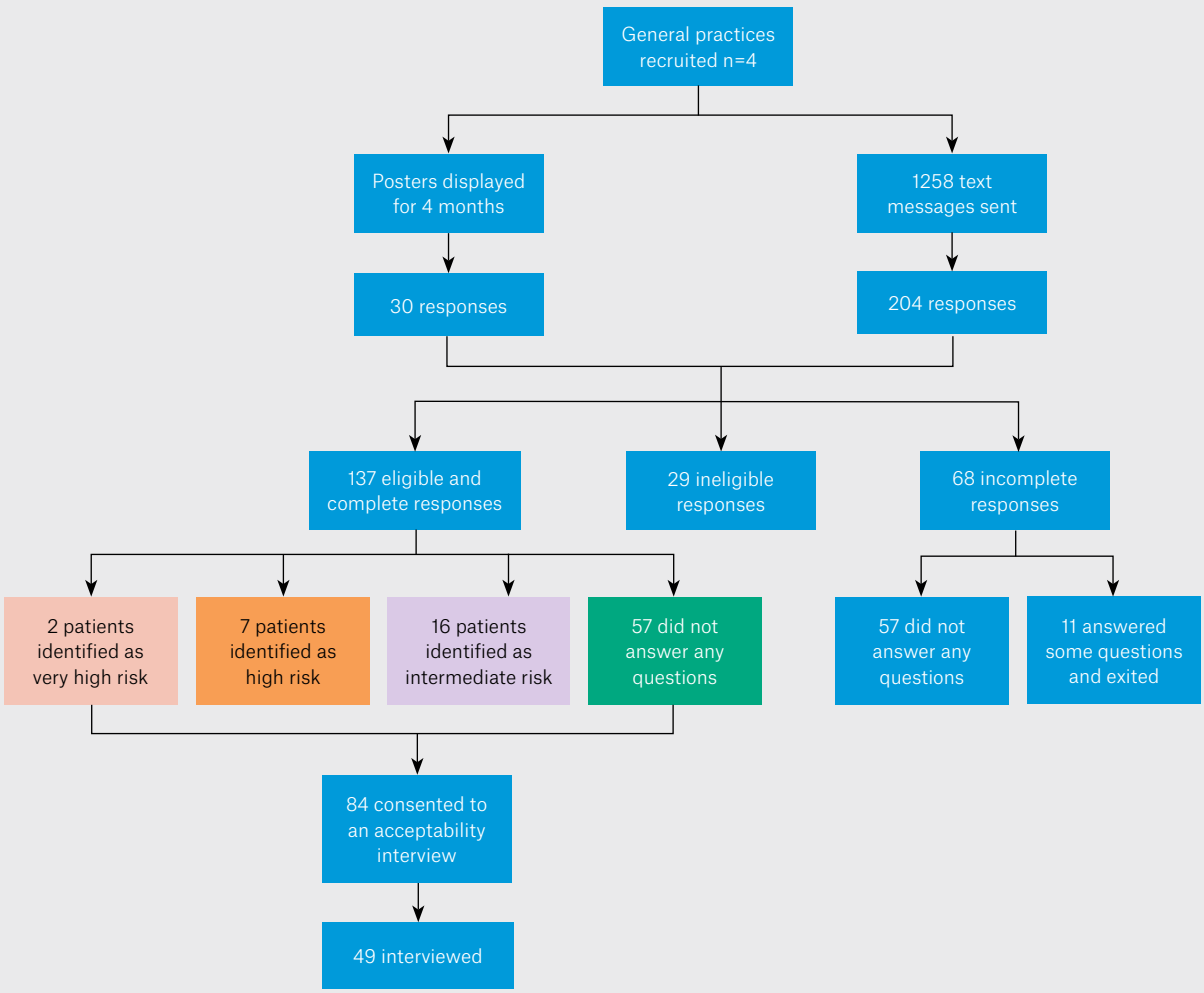

Figure 2. Flow chart of the results of familial hypercholesterolaemia screening.

Table 2. Major themes elicited from the acceptability interview

Interview question	Major themes	Illustrative quotes (Practice number, responder designation[A])
Reason for participation	Wanting to contribute to research	'*I think research is important*' (Practice 2, 19) '*I like participating in studies*' (Practice 2, 30)
	Concerned about my own risk	'*My nan has angina and coronary artery disease*' (Practice 2, 32) '*I had these things happen in the family*' (Practice 2, 38) '*It was about heart disease and I'm 59*' (Practice 1, 46)
	I like/trust my GP	'*I've had such a long association with the doctors' surgery that, since it was coming from them, I was happy to*' (Practice 2, 47) '*I just like my doctor*' (Practice 1, 25)
	Boredom	'*I was bored*' (Practice 3, 2; Practice 4, 14; Practice 1, 36) '*Boredom*' (Practice 1, 19)
Discussing with others	Raising awareness	'*To raise awareness for them*' (Practice 3, 12) '*To get the words out there*' (Practice 4, 14) '*The earlier you find out about these sorts of things the more easily you're able to manage that risk*' (Practice 3, 7)
	My family might also be high risk	'*Because if I can be at high risk then my sisters can be at high risk*' (Practice 2, 32)
	Would rather not discuss with others	'*Several of them have enough health issues of their own without worrying about me*' (Practice 4, 7) '*I'd probably tell my husband not my kids, just so that he knew*' (Practice 4, 7)
	Others can support me if I'm diagnosed	'*They would be able to help support me*' (Practice 3, 27) '*They would be able to help me out*' (Practice 2, 30)
Discussing with your health provider	I expected the doctor to raise the discussion	'*Only if he raises it*' (Practice 2, 50) '*I will talk about it if she plans to talk about it*' (Practice 2, 51) '*I just imaged that if there was any issues … she would let me know*' (Practice 2, 17)
	I'm low risk so didn't need to discuss	'*There was nothing concerning, so no*' (Practice 2, 42) '*I don't think I'm at an increased risk*' (Practice 2, 52) '*I was a low-risk category, so I don't feel the need to have that conversation*' (Practice 1, 19)
	I've already discussed heart health with my GP	'*I've discussed the high cholesterol with the doctor*' (Practice 1, 31) '*I have a cardiologist who I've seen*' (Practice 1, 42)
Barriers to completing the questionnaire	I don't know my family history	'*It's hard to answer I guess if you don't know exactly what your family history is*' [Practice 2, 17) '*I wasn't too sure about some of the medical history of my parents*' (Practice 2, 47)
	It was very easy/simple	'I *thought it was very good. I breezed through it*' (Practice 1, 46) '*I think it was very easy, I probably would have just closed the survey if it was too long or difficult*' (Practice 3, 24)
	Would be better if a medical professional was involved	'*The data is far better for you guys if it was done in the presence of a doctor or nurse*' (Practice 2, 50) '*Could be better off being supervised by a medical professional*' (Practice 1, 67) '*I wasn't sure about my own eyes looking for the different colour on the outside*' (Practice 3, 6)
	The elderly might not be tech savvy	'*If you had an elderly patient, I think it'd be quite difficult for them to navigate that*' (Practice 4, 2)

[A]Responder designation corresponds to the patient number, with participating patients numbered from 1 to 49.

GP, general practitioner.

Four main themes were identified when participants were asked about discussing the questionnaire and its results with others, as details below.

Raising awareness
Participants recognised that informing others that they completed the questionnaire might raise awareness of the issue and encourage them to assess their risk. Some identified that by informing others, they would be promoting earlier detection and prevention.

Relatives might also be at risk
Many identified that their family might also be at risk, given the condition is hereditary, and this would be a reason to share information.

Would rather not discuss with others
A number of participants said they would rather not discuss the questionnaire or its findings with anyone so they would not worry others. A few mentioned that they would only inform their partner, but not other family members.

Others can support me if I'm diagnosed
Several participants said they would discuss their results with others for support if they were high risk. Some identified needing physical or emotional support with the diagnosis or getting to appointments.

The vast majority of participants (96%) did not discuss their screening result with any health practitioner, with three main themes emerging, as detailed below.

I expected the doctor to raise the discussion
A large proportion expected their GP to initiate discussion about the screening. Many assumed they were not high risk because their GP did not discuss their results.

I've already discussed heart health with my doctor
Some participants stated that they had already had discussions with their GP about their cardiovascular risk or were already seeing a cardiologist and, therefore, did not discuss their results with their GP.

I'm low risk so didn't need to discuss
Several participants felt that they were low risk, and so did not need to discuss the results based on their screening answers.

Discussion

Summary

This is the first known Australian study to examine the acceptability of a digital FH self-screening tool in a general practice setting. FH self-screening led to favourable detection rates, and participants found self-screening acceptable. This proof-of-concept study shows that with further refinements, FH self-screening might be a viable mechanism for identifying previously undetected cases of FH.

FH self-screening

A previous Australian study that used automated data extraction software to assess FH risk found a smaller proportion than the present study (0.79%) to be potentially high risk (1843/232,139).[10] Of these, 800 (0.3% of total) were confirmed to be high risk following GP review.[10] However, that study used LDL results, which might have excluded many potential high-risk patients who did not have an LDL measure. The higher rate of high-risk patients observed in the present study might also be due to the patient-reported personal and family history items and physical signs of hypercholesterolaemia. These items are generally poorly recorded in the eMR and often not documented in the fixed fields of the record.[7,8] However, these items might have been beneficial for identifying potential high-risk FH patients aged <45 years, because many would not have had lipids assessed based on guidelines.

The results of the qualitative study identified several ways in which FH self-screening could be improved. Some participants found questions regarding family history and clinical signs challenging. Further refinements to the current tool and digital interface relating to these questions would be required for upscaling FH screening.

Limitations of FH self-screening

The overall response rate to the self-screening was low, and recruitment via posters displayed in the practices was especially low. The barrier of interacting with a digital survey was a factor that some participants noted, but is less likely to be a barrier for younger patients who are more comfortable with technology. Furthermore, we did not collect data on subsequent tests/diagnoses that were established among participants identified as high risk.

Acceptability survey

The acceptability survey suggested that harnessing patient boredom (eg when patients are in the GP waiting room) might be an opportunistic moment in preventive healthcare, alleviating time constraints during consultations.

Survey participation secondary to trust of one's GP was another common reason for engagement. This finding supports the notion that strong patient rapport and continuity of care are important in achieving preventative health goals and optimising health outcomes.[19–21] However, our data showed low rates of patient-initiated discussion around their screening results with their GP. In the present study, there was a time delay in the screening results being imported into the eMR; therefore, the results might not have been 'top of mind' for the GP at the next consultation. Strategies to prompt GPs and patients to discuss the results could be integrated into the self-screening tool, such as screen pop-ups for GPs and SMS reminders to patients.

Although many participants identified a potential familial implication associated with a high-risk result, some expressed not 'wanting to worry others'. Given that poor health outcomes associated with FH are highly preventable, this lack of understanding might be a contributing factor to both underdiagnosis and the morbidity associated with FH, and emphasises the importance of patient education.[6] It would be of value to further explore the GP perspective on FH self-screening concerning perceived benefits for case identification and cascade screening.

Limitations of the acceptability survey

Conducting the acceptability questionnaire via telephone might have limited participants' responses because it warranted an immediate response. The desire to please the doctor/researchers conducting the survey, especially as patients identified a like/trust for one's GP as the reason for participation, might have skewed patient feedback. Furthermore, there was a delay of days (or weeks, in some

instances) between completing the screening and participating in the acceptability interview, which might have influenced the accuracy of participants' feedback.

Implications and future directions

Programs that can provide fully integrated preconsultation questionnaires to patients are currently being used in Australian practices, and adopting these technologies to distribute self-screening surveys enables patients to have responsibility and an active role in their healthcare.[20] Further iterations and upscaling of the self-screening model used in this study could be improved by providing self-screening tablets in GP waiting rooms where patients may be able to visualise pictures of clinical signs of hypercholesterolaemia more clearly. Furthermore, a fully integrated self-screening tool that instantly imports screening results into the patient file and prompts the GP when the file is opened might operate more seamlessly into the practice workflow.

We are addressing the low rates of screening and feedback from the process evaluation to develop a more streamlined system of patient self-screening that integrates with practice IT systems and fits more seamlessly in GPs' workflow. This next iteration will permit the screening results to be instantly available to the GP; data from screening rates and case identification will assess whether these improvements increase the screening rate. These results will then be linked with evidence-based management recommendations. The increasing use of artificial intelligence in health might also be used to identify individuals at increased risk of FH using algorithms that scan data in the free- and fixed-text components of the medical record, so that individualised screening questions are sent to patients.

However, in the interim, GPs can identify cases of FH through data extractions of pathology test results and family histories of their patient database. This can be done in most medical record software, and can be automated to identify cases on a regular basis.

Conclusion

This proof-of-concept study showed that FH self-screening can be implemented in general practice. Further refinements need to be undertaken to improve patient participation. However, the model was acceptable to patients and successfully identified those at high risk of FH. If implemented more broadly, FH self-screening could increase the detection of FH, lowering rates of preventable CVD.

Authors

Stephanie Eid MChD, BMedSci, FRACGP, General Practice Registrar, Department of General Practice, School of Medicine, University of Notre Dame, Sydney, NSW

Katrina Giskes MBBS, PhD, BHlthSc (Nutrition & Dietetics) (Hons) FRACGP, General Practitioner, Ochre Health, Wentworth Falls, NSW; Research Fellow, Department of General Practice, School of Medicine, University of Notre Dame, Sydney, NSW; Research Fellow, Heart Research Institute, Sydney, NSW

Donna Jeong BMedSci, School of Medicine, University of Notre Dame, Sydney, NSW

Luke Jennings BSc (Hons), School of Medicine, The University of Notre Dame, Sydney, NSW

Edward Dababneh MD, BMedSci, School of Clinical Medicine, The University of New South Wales, Sydney, NSW

Margot Woods MBBS, General Practitioner; Discipline Lead, General Practice, Department of General Practice, School of Medicine, University of Notre Dame, Sydney, NSW

Charlotte Hespe AM, MBBS, PhD, FRACGP, General Practitioner, Glebe Family Medicial Practice, Sydney, NSW; Professor of General Practice, Department of General Practice, School of Medicine, University of Notre Dame, Sydney, NSW

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Correspondence to:
katrina.giskes@nd.edu.au

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Wanted: Nearer peers for teaching and learning in general practice

Michaela Kelly, Nancy Sturman, Alison Green, Cherri Ryan, Beth Shirley, Annabel Chau, Scott Preston, Claire Jackson

SHOULD MEDICAL STUDENTS in general practice only be placed with experienced general practitioners (GPs) or should they also work with, and learn from, GP registrars? The answer, from previous literature and our recent findings, is 'Both', with each offering different but valuable learning experiences. Establishing a model where registrars in training and early-, mid- and late-career GPs collaborate in the teaching of medical students creates teaching and learning synergies. Importantly, strengthening near-peer teaching and learning relationships in general practice could positively impact on general practice recruitment, retention and work satisfaction.

We know that medical students value general practice placements; many GPs cite positive student experiences as having influenced their career decision[1,2] and students placed in general practice for longer periods are more likely to enter general practice training.[1–3] Universities are responding to the well-identified need[4,5] to attract more medical students into general practice careers by embedding more general practice teaching in medical programs.[6,7] To mitigate strain on the teaching capacity of general practices, we explored a more structured approach to consider whether GP registrar teaching of medical students should be implemented more widely.

Methods

In 2023 we piloted the placement of second-year medical students with GP registrars and specialist GP teachers/supervisors for seven weeks each, in a weekly half-day placement over 14 consecutive weeks. Of 30 eligible teaching practices, 27 students consented to participate. Following a sequential consent process, we recruited seven practices where students, GP registrars, GP teachers and GP supervisors consented. Seven student–GP registrar pairs participated in the pilot and allowed us to dig deeper into the current barriers and enablers for near-peer teaching and compare the overall experience of students, GP registrars, GP teachers and GP supervisors through survey evaluation and participant (medical student, GP registrar and GP teacher/supervisor) focus groups.

Results

Our findings were consistent with other literature,[8–13] suggesting that near-peer teaching and learning experiences in general practice are positive, and are summarised in Table 1.

Some of the highlights from our study were that GP registrars and GP teachers liked 'sharing the [teaching] load' and providing students with diverse learning experiences. Registrars viewed teaching as 'giving back', and part of their professional identity. They enjoyed the collegiality of working with students and found the students' questions motivated their own learning and consolidated their knowledge. Registrars desired more near-peer experiences with recent Fellows in their own training and welcomed students' current knowledge of hospital contexts, from which they felt quite isolated.

Some GP teachers and registrars were concerned that less confident registrars might be overwhelmed by taking on teaching roles, especially early in their transition to GP training or during periods of more intense study for Fellowship examinations. One experienced supervisor commented that GP registrars tended to underestimate their knowledge and abilities, and that being 'encouraged and empowered' to teach built their confidence. The registrars in the pilot embraced teaching, found it valuable and enjoyed it. There was little appetite for mandating student teaching as part of GP registrar training, but facilitating this was seen as highly desirable.

The student learning experience with registrars differed from that with more established GP teachers, with more emphasis on accessing guidelines at point of care, fewer regular and elderly patients, less time pressure on consultations, more new and acute presentations and lower patient loads. Both students and registrars identified the value of students observing registrars seeking help. Students found the registrars' clinical reasoning process more explicit and transparent, and found the established GP teachers' prior knowledge of patients sometimes made it challenging to follow the consultation. The benefits of cognitive

Table 1. Benefits of general practitioner registrar teaching of medical students

Benefits for the student	Benefits for the registrar	Benefits for the GP supervisor	General benefits
Fosters more relaxed interactions as closer in age and stage	Aligns with teacher dimension of professional identity	Shares the teaching load within the practice	Fosters a greater teaching culture within general practice
Enhances learning due to social and cognitive congruence	Consolidates and refreshes learning	Enhances teaching focus within the practice	Positively impacts on GP workforce recruitment
Aligns with the student focus on assessment and learning outcomes	Reconnects registrar to university and hospital environments	Expands GP supervisor's perspective on teaching and vertical integration	Creates efficiencies through better use of an underutilised educational resource
Enhances student understanding of training pathways and associated requirements	Reduces sense of professional isolation	Develops the registrar's skills and learning	Improves student perception of general practice as a career
Exposes students to more explicit clinical reasoning and new/acute consultations	Enhances skills, knowledge and confidence	Provides novel insights into the registrar and medical student	Enhances collegiality between medical students, registrars and GPs
Demonstrates help-seeking behaviours of registrars with more experienced GPs	Broadens learning and repertoire of teaching skills	Enhances self-efficacy of registrar during training	Provides more diverse learning experiences for students and registrars
Models more consistent use of clinical guidelines at point of care			Provides opportunities for vertical integration of learning
Provides different types of consultations compared with more established GPs			

GP, general practitioner.

Box 1. Multilevel strategies to support general practitioner registrar teaching in general practice

Actively promote a culture of teaching across general practice[A–C]

Facilitate near-peer teaching and learning across all stages of general practice training[A,B]

Aim, where possible, to create or adapt physical work environments to support teaching in general practice settings[A]

Enhance financial support and recognition of practice-based medical student teaching[E]

For GP registrars who wish to participate in teaching, negotiate a comfortable teaching load and adjust teaching responsibilities during periods of additional pressure (eg Term 1 and proximity to exams)[A,B]

Provide training for GP registrars in teaching and mentoring skills[A–C]

Provide protected time and recognition for registrar teaching and peer educator roles, including delivering teaching to junior doctors and medical students[A–D]

Develop partnerships with universities and hospitals to increase opportunities for GP registrars to contribute to medical student and junior doctor teaching[B–D]

[A]Individual general practices.

[B]The Royal Australian College of General Practitioners, general practitioner (GP) training organisations.

[C]General practice departments within universities, medical schools.

[D]Training hospitals.

[E]Australian Government Department of Health and Aged Care.

and social congruence[10] was evident, with students feeling more relaxed and connected to registrars through their more recent medical school experience, knowledge of hospital systems and training pathways, which gave students 'a better idea of where I'm at' in terms of career planning. Students appreciated the registrars' increased focus on student learning outcomes and assessment.

Discussion

Although the case for multilevel learning in general practice has been made previously, barriers have been identified.[7,14] Some practices have been reluctant to place students in registrar consultations because of various concerns, including previous uncertainty about teaching payment eligibility, the perceived burden on registrars[14] and a preference for students to learn from specialist GPs. Our study and previous studies suggest

that such hurdles are not insurmountable, and that with careful planning and support at practice, university, training college and government levels, they can be overcome.[7–14] In Box 1, we make recommendations about strategies to enable GP registrar teaching to flourish within general practice.

Conclusion

As general practices welcome more medical students, the time has come to embed (but not mandate) near-peer work-based teaching and learning more widely across GP training. Although it is imperative to expose learners to more established practitioners, we believe that sharing this role with GP registrars creates many learning synergies, as well as spreading the teaching load. We should support and promote, rather than protect our learners from, nearer-peer teaching in general practice.

Authors

Michaela Kelly BMedSc, MBBS, FRACGP, GCHEd, MClinEd, Associate Professor, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld

Nancy Sturman MBChB, BA, FRACGP, PhD, Associate Professor, General Practice Clinical Unit, The University of Queensland, Brisbane, Qld

Alison Green BBus/LLB, MBBS, DCH, MPhil, FRACGP, Senior Lecturer, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld; General Practitioner, Family Doctors Plus Windsor, Brisbane, Qld

Cherri Ryan MBBS, FRACGP, GCHSt, Cert IV TAE, Clinical Senior Lecturer, General Practice Clinical Unit, The University of Queensland, Brisbane, Qld

Beth Shirley BSc, MBBS, FRACGP, Senior Lecturer, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld; General Practitioner, Queensland Children's Lung and Sleep Specialists, Brisbane, Qld

Annabel Chau BSc, MBBS, FRACGP, SCHP, Senior Lecturer, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld; General Practitioner, University of Queensland Health Care St Lucia, St Lucia, Qld

Scott Preston MBBS, FRACGP, PG Cert Med Ed, Associate Professor, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld; Senior Medical Officer, Southern Queensland Centre of Excellence in Aboriginal and Torres Strait Islander Primary Health Care (Inala), Brisbane, Qld; Senior GP Clinical Editor, Healthpathways Gold Coast (Gold Coast HHS), Southport, Qld

Claire Jackson AM MBBS, MD, MPH, CertHEcon, GradCert Management, FRACGP, FAICD, Professor in General Practice and Primary Care Reform, General Practice Clinical Unit, Medical School, The University of Queensland, Brisbane, Qld; Director, UQ/MRI Centre for Health System Reform, and Integration, Brisbane, Qld

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Correspondence to:
m.kelly4@uq.edu.au

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Shortfalls of a new Medicare-funded genetic screening program

Tayla Cameron, Jenny Lou

THE 2023 announcement of funding for reproductive genetic carrier screening (RGCS) for cystic fibrosis, spinal muscular atrophy and fragile X syndrome comes because of important advocacy work[1,2] as a part of a greater than $80 million pledge from the Australian Government tagged for supporting access to genetic screening in the population. Screening for these conditions corresponds to Medicare Benefit Schedule (MBS) items 73451 and 73452 and represents a combined screening initiative. However, a lack of corresponding health promotion and education for providers threatens to undermine this important initiative. If properly supported, general practitioners (GPs) are confident and capable of delivering genetic counselling;[3] however, in current practice this is not the case. This viewpoint asserts that this flaw (in not offering support to GPs) will lead to poor service utilisation, increased burden on GPs and potential healthcare anxiety.

There are two options when referring for reproductive carrier screening: sequential or couple testing. Medicare stated that the funding scheme would 'support informed reproduction decision-making' and improve access to RGCS (a test that previously cost more than $450).[1] This change came following the pilot study completed for Mackenzie's Mission in 2019.[2]

Mackenzie's Mission offered screening to 9107 couples across Australia via key providers such as GPs, obstetricians and midwives for 750 severe childhood-onset genetic conditions.[2] The three-year study aimed to determine the evidence for making free RGCS available to all couples in Australia. The offer of screening was provided to couples, who were then given information resources and a decision-making aid to supplement their participation in screening. The results were then provided to couples, who were supported with counselling services and genetics education to enable them to implement the results in a way that best suited their individual values.[2]

The evidence from Mackenzie's Mission was overwhelmingly positive from a patient perspective,[3] but there were concerns raised by healthcare providers, particularly GPs. For example, one paper out of Mackenzie's Mission that examined practitioner beliefs around RGCS stated that GPs reported concern about their ability to discuss high-risk results, especially the possibility of pregnancy termination in women in early pregnancy.[4] There was also concern about the 'concept of risk assessment, lack of confidence in offering prenatal genetic advice [and] apprehension around interpreting and explaining the screening results'.[4] Throughout the GPs included in the study, there was a call for education and support for practitioners around genetics[4] to support the delivery of post-test counselling services. This provided clear evidence for the barriers to implementation in general practice to be considered should a program like this be funded.

Instead of following these proposals, the Australian Government's funding program includes only three-condition screening (aforementioned),[1] in comparison to Mackenzie's Mission's extended carrier screening program. In addition to the structure of testing being minimally applicable to Australian MBS item funding, it also does not include allocation of funds to health promotion or education material. Nor does it include supports for either participants (eg in the form of genetic counselling) or providers. Although this is not the responsibility of the MBS, it is reasonable to suggest that at least part of the $400 subsidised to pathology services when RGCS is ordered could be distributed to assist colleges such as The Royal Australian College of General Practitioners (RACGP) to develop centralised practitioner and patient support. For example, Mackenzie's Mission went so far as to develop a decision aid designed for this Australian government-funded screening program to supplement conversations between GPs and their patients, and it too was not included within resources for practitioners.[5]

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) official statement on genetic carrier screening (current 2019) states:

> Recommendation 3: Information on carrier screening for other genetic conditions should be offered to all women planning a pregnancy or in the first trimester of pregnancy.[6]

This is regardless of family history or geographic origin.[7] The Australian government-funded RGCS program recommends GPs (and the RACGP) upskill their Fellows further in genetics without allocating funding to do so and adds yet another service to their already demanding expected repertoire unsupported. GPs, as the forefront providers of RGCS, were not consulted in the development of these policies or their implementation. GPs, without the provision of support, seldom have the time and expertise to provide detailed genetic education to families who access screening services.[4,8] Thus, providing some of the pledged budget for GP education and the development of resources through colleges such as the RACGP is warranted.

This aside, the implementation of the screening program was minimally promoted to the public, and both the screening program itself and its utility are poorly understood by most community members.[9] Studies conducted in the field suggest that knowledge of RGCS is lacking in the general population, and ongoing education is necessary.[9,10] There have been no standardised patient resources provided to general practices as part of the pledged funding to reflect this area of deficit. It has been up to pathology providers to design such resources and have them available.[11] Compounding this problem, GPs reported that a couple's knowledge of RGCS was 'reflected in the time required at consultation'.[4] This not only affects patient understanding of their own healthcare experiences, but it also slows the day's appointment books and decreases earning capacity within general practice, another likely contributor to RGCS hesitancy among GPs.

Furthermore, in an Australian context, the evidence used to inform the usefulness of the RGCS program in Mackenzie's Mission does not translate to the program that eventuated in the MBS because of substantial differences in what is offered to participants of each screening program.

If international experience tells us anything, it suggests that appropriate use of RGCS requires significant consumer health literacy regarding prenatal genetics, which is frequently lacking in the general population.[9,10] Although international data on RGCS exist within very different subsets of populations and vary between paid versus subsidised services,[12] little is known about RGCS in Australia, even with Mackenzie's Mission in mind.

If you are a GP and wish to upskill in these matters yourself, some resources are available through the RACGP, including the *Genomics in general practice* online guide.[13,14] The Victorian Clinical Genetics Services also deliver online learning modules aimed at educating GPs.[15]

In summary, the new MBS program funding through items 73451 and 73452 is at grave risk of being underutilised or, worse yet, misunderstood despite its best intentions. Its lack of correlating education programs for doctors or patients has disrupted the smooth implementation and equitable use the program intended. The current state of practice risks creating another prenatal tool that generates health anxiety instead of decision-making freedom if it does not support GPs to discuss results with their patients. A review of the funding structure and allocated rebates is needed to ensure that taxpayer dollars are used in a way that generates the most health benefit for the lowest dollar value and supports the capacity of Australian GPs, with time and money allocated to detailed education for all those involved.

Authors

Tayla Cameron BBiomedSc, Ballarat Clinical School, Deakin University, Ballarat, Vic

Jenny Lou MD, FRACGP, GCertChHlth, General Practitioner, Health First Medical Group, Ballarat, Vic

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Correspondence to:
taylarjack@outlook.com

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