

# At-home pulmonary rehabilitation: Case Study

Chronic Obstructive Pulmonary Disease (COPD) was the fifth leading cause of death in Australia in 2020. With early diagnosis and treatment, people with COPD can breathe better and live healthier lives. NHMRC-funded researchers at Monash University have been at the forefront of developing and trialling in-home rehabilitation as a way to improve access for patients with COPD, providing an alternative to the traditional in-person delivery at outpatient facilities. Their work has resulted in a transformative shift of clinical practice towards a more integrated model of disease management (in-person and at-home via web-based platforms).



## Origin

Breathing is a daily struggle for people with Chronic Obstructive Pulmonary Disease, an umbrella term for a group of lung conditions that includes emphysema, chronic bronchitis and chronic asthma. The condition can be developed from smoking cigarettes, exposure to pollution and some genetic predispositions. In 2020, 6,311 Australians died from COPD<sup>1</sup>, making it the fifth leading cause of death after coronary heart disease, dementia and Alzheimer's disease, cerebrovascular disease, and lung cancer.

Pulmonary rehabilitation is considered an essential component of COPD care and is recommended in clinical practice guidelines across the world. Key benefits of pulmonary rehabilitation include reduced symptoms, improved physical capacity and reduced admissions to hospital. Rehabilitation consists of supervised exercise training, education, self-management strategies, and support delivered by a multidisciplinary team at least twice a week for eight weeks or longer in either an inpatient or outpatient setting.

Despite the strong evidence for its benefits, pulmonary rehabilitation has traditionally been delivered to less than 5% of patients who would benefit. Contributors to this global failure of research translation have included a lack of available programs, or programs that are inaccessible to patients, particularly for those living outside metropolitan centres and those who are disabled by breathlessness.

Travelling to a rehabilitation centre for regular appointments can seem an insurmountable obstacle to people who are breathless with even small amounts of physical activity. The COVID-19 pandemic has exacerbated these problems as face-to-face services closed and vulnerable patients continue to isolate at home.

## Grants and Investment

Supported by NHMRC funding, pioneering work on pulmonary rehabilitation has been undertaken by a multidisciplinary team led by Anne Holland and including Christine McDonald, Ajay Mahal, Jenny Alison, Natasha Lannin, Narelle Cox and Angela Burge.

Early development and pilot testing of Holland's home-based pulmonary rehabilitation models was supported by philanthropic funders including the Windermere Foundation (2008), Churchill Trust (2009) and Lung Foundation Australia (2012), with expert technical advice provided by Telstra's External Research and Development Program (2010).

Since 2013, NHMRC has provided funding to support large-scale testing of new approaches to delivering at-home COPD rehabilitation through two major multi-site clinical trials. Major projects undertaken by the team and supported by NHMRC include:

- *HomeBase* trial on the benefits and costs of home-based pulmonary rehabilitation in chronic obstructive pulmonary disease (2013)
- *Rehabilitation Exercise At Home* (REACH) trial investigating telerehabilitation for chronic obstructive pulmonary disease (2016)
- Continuation of the REACH trial, with a focus on improving equity of access and patient-related outcomes (2016)
- An investigation into early HomeBase pulmonary rehabilitation after hospitalisation in chronic obstructive pulmonary disease (2018)
- Transforming pulmonary rehabilitation to reduce hospital admissions in COPD (2019)
- Research into optimising patient & health system outcomes in chronic respiratory disease (2020).

## Results

The team's HomeBase trial showed that a low-cost, telephone-delivered model of rehabilitation could be provided entirely at home with similar clinical outcomes as centre-based rehabilitation.

Importantly, far more people with COPD were able to complete the home-based program (91%, compared to 49% of centre-based participants). Those who completed a program of either type were 56% less likely to be admitted to hospital in the following 12 months.<sup>2</sup>

Building on the groundwork of the HomeBase trial the team subsequently developed a new model of virtual group rehabilitation. The REACH trial involved supervised exercise training and education for groups of people with COPD using a videoconferencing platform. It was successfully delivered to patients located in both metropolitan and rural Australia, suggesting an important future role of telerehabilitation in improving program accessibility in regional areas.



Clinician conducting Telerehab. Source: Monash University

## Translation

The COVID-19 pandemic has fast tracked the implementation of telerehabilitation at scale: the gap between the generation of research evidence and its implementation into clinical practice has been significantly narrowed due to the need to adapt to remote medical consultation and treatment. The new remotely delivered models have been widely promoted during the pandemic both in Australia, for example via Agency for Clinical Innovation (NSW) and globally, including in guidelines published by the American Thoracic Society, the British Thoracic Society, the Canadian Thoracic Society and the Association of Chartered Physiotherapists in Respiratory Care (UK).

With the rise of COVID-19 and its particular impact on breathing and the lungs, the Holland team's research and new delivery models for pulmonary rehabilitation programs have become critically important.

Programs have also been adopted for rehabilitation of COVID-19 patients. The use of the Holland team's models of remote pulmonary rehabilitation have been promoted by peak bodies globally.

The team's work has been cited in 27 clinical guidelines and position papers on pulmonary rehabilitation, pulmonary fibrosis, COPD, skeletal muscle dysfunction, oxygen therapy and respiratory management, from eminent bodies including the Global Initiative for Chronic Obstructive Lung Disease and Thoracic Societies in the UK, USA, Europe, Asia and Australia/New Zealand.



Patient undergoing Telerehab. Source: Monash University

## Health Outcomes and Impact

### Health outcomes

Australia's health system has traditionally delivered pulmonary rehabilitation programs in outpatient facilities usually attended by patients twice a week. Holland and her team's clinical trials showed that home-based models of pulmonary rehabilitation deliver safe care, are highly acceptable to patients and achieve clinically meaningful gains in patient-centred outcomes.

The HomeBase and REACH trials demonstrated improvements in functional exercise capacity, symptoms and health-related quality of life that were equivalent to those seen in centre-based pulmonary rehabilitation. Home-based participants were more likely to complete the program, with an associated reduction in hospital admissions over the next 12 months.

### Economic impact

In Australia, more than any other chronic disease, COPD is responsible for preventable hospital admissions (260 per 100,000 people in 2015-16) and is a major contributor to health care costs with annual health system costs exceeding \$970 million.<sup>1</sup> The HomeBase trial showed that nearly twice as many people were able to complete home-based rehabilitation than centre-based rehabilitation and that, for every patient who completes pulmonary rehabilitation, regardless of location, annual health care costs are reduced by \$10,620, primarily as a result of fewer hospitalisations.<sup>3</sup> Hospital admissions due to COPD are expected to double by 2030<sup>4</sup>, so the projected economic impact is significant.

### Policy and practice

The home-based pulmonary rehabilitation models designed by Holland's team have been rapidly implemented in clinical care. Prior to this research, home-based pulmonary rehabilitation was offered in less than 5% of programs worldwide.<sup>5</sup> Following publication of Holland's work there was rapid uptake into practice, with 34% of pulmonary rehabilitation programs in the UK offering a home-based service by 2019.<sup>6</sup> This uptake has been accelerated during the pandemic. In New Zealand, 59% of programs delivered remote pulmonary rehabilitation by September 2020, compared to 0% in Sept 2019.<sup>7</sup>



Note: NHMRC grants are dated by their start year

### Prof Anne Holland

Anne Holland graduated with a Bachelor of Applied Science (Physiotherapy) from The University of Sydney, 1994, and a PhD from The University of Melbourne in 2004. She was first appointed to Alfred Health in 1999 as a Senior Physiotherapist. Since 2019 she has held a joint appointment as Professor of Physiotherapy at Monash University and Alfred Health. Holland's academic focus is on non-drug treatments for patients with chronic respiratory disease, including COPD and pulmonary fibrosis.

In 2021, Holland was appointed Head of Respiratory Research@Alfred at Monash University's Central Clinical School.

### Prof Christine McDonald AM

Christine McDonald is a respiratory physician with expertise in the medical management of COPD. She is the Director of the Department of Respiratory and Sleep Medicine at Austin Health. In 2018, McDonald was made a Member of the Order of Australia.

### Prof Ajay Mahal

Ajay Mahal is a Professor of Health Economics and Global Health Systems Research at The University of Melbourne with over 25 years of experience as an economist. He is currently Deputy Director of the Nossal Institute for Global Health.

### Prof Jenny Alison

Jenny Alison is a Professor of Respiratory Physiotherapy and Allied Health at The University of Sydney with an interest in enhancing the research capacity of allied health clinicians.

### Prof Natasha Lannin

Natasha Lannin is a Professor of Neuroscience at Monash University with expertise in implementation science. With a background as an occupational therapist, she currently leads the Brain Recovery and Rehabilitation Research Group in Monash University's Department of Neuroscience.

### Dr Narelle Cox

Narelle Cox is a physiotherapist and Senior Research Fellow in the Central Clinical School at Monash University and Alfred Health. Her research focuses on improving access to rehabilitation services through the use of telemedicine.

### Dr Angela Burge

Angela Burge is a research physiotherapist in the Central Clinical School at Monash University and Alfred Health. As part of her NHMRC-funded PhD, she developed a combination of skills in physiotherapy, clinical research and economics.

### Future Research (post-pandemic)

Funded by the Australian Government's Medical Research Future Fund (MRFF), Professor Holland's team now supports programs across Australia to offer patients the choice of a home-based or centre-based program. Adapting service delivery in response to COVID-related restrictions highlighted that, outside clinical trials, the advantages of telehealth are neither universal nor automatic. Learning about patient preferences and how to effectively integrate telerehabilitation models in clinical practice will show whether offering this choice can increase uptake and completion of pulmonary rehabilitation in the long term and reduce subsequent hospital admissions.

A key future focus will be to obtain a better understanding of barriers to implementation of home-based pulmonary rehabilitation programs and how they can be overcome, e.g. availability of technology and internet access, increased digital literacy for patients and providers, and adaptations for local context and environment.



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## References

This case study was developed with input from Professor Anne Holland and in partnership with Monash University. The information and images from which NHMRC Impact Case Studies are produced may be obtained from a number of sources including our case study partner, NHMRC's internal records and publicly available materials.

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## Partner/s



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