

SHORT COMMUNICATION

A review of the availability and cost effectiveness of chronic obstructive pulmonary disease (COPD) management interventions in rural Australia and New Zealand

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ABSTRACT

Introduction: Chronic obstructive pulmonary disease (COPD) is a chronic, progressive disease, which consumes a significant proportion of the Australian and New Zealand healthcare budget. Studies have shown that people living with COPD outside of urban areas have higher rates of hospitalisations. Two international reviews have demonstrated reduced hospital admissions and length of stay in people with COPD who participate in an integrated disease management program. However, most studies included in these reviews are in urban settings. The purpose of this review is to explore the type and cost-effectiveness of COPD management interventions located in rural or remote settings of Australia and New Zealand in order to inform planning and ongoing service development in the authors' local health district.

Method: Six databases and Google scholar were searched to find literature relating to the availability and cost-effectiveness of non-pharmaceutical interventions for the management of COPD in rural and remote areas of Australia and New Zealand.

Results: Two studies were found that met the inclusion criteria. Both studies had small sample sizes, were single intervention studies and showed a positive influence on variables such as number of hospital admissions and length of stay at 12 months post-intervention. However, because of the limited number of studies and the lack of homogeneity of interventions, no conclusions regarding availability and cost-effectiveness of COPD interventions in rural and remote areas of Australia and New Zealand could be drawn.



Conclusions: Limited literature exists to inform planning and development of services for people with COPD living in rural and remote areas of Australia and New Zealand. Approximately 50% of pulmonary rehabilitation programs are situated in rural and remote locations in Australia and New Zealand. Outcomes from existing programs need to be reported in a consistent and coordinated manner to allow evaluation of health resource utilisation.

Keywords: Australia, COPD, cost-effectiveness, New Zealand, respiratory.

Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive, disabling respiratory disease¹, which costs the Australian health budget A\$929 million/year² and New Zealand NZ\$129 million/year³. People with COPD present with a wide variety of symptoms, functional limitations and co-morbidities and vary greatly in presentation as they progress towards more severe stages of the disease⁴.

People with COPD living outside urban areas experience poorer health outcomes such as higher rates of hospitalisation and mortality^{2,5}. Approximately 14% of New Zealanders live in non-urban settings⁶ and 33% of Australians live in rural or remote areas⁷. On average, Australians living outside urban areas have poorer health risk factor profiles, lower levels of education and lower incomes compared with those living in major cities⁸. They also experience lower levels of access to health and other services with almost all health professions being less prevalent⁹.

The progressive and complex nature of COPD suggests that a multifaceted approach to its management is required¹⁰. Kruis et al¹¹ reviewed 26 studies from 11 different countries of integrated disease management (IDM) for people with COPD. Each study reported at least two interventions with two different healthcare providers and of at least 12 weeks duration. Participants in an IDM program had better quality of life, exercise tolerance, reduced respiratory-related hospital admissions and hospital days at 12 months review. Likewise, Peytremann-Bridevaux et al¹² found similar results in their review of 13 studies of COPD disease management programs.

While these reviews demonstrate positive outcomes, the majority of studies were located in urban areas. The Australian Lung Foundation's database of Pulmonary Rehabilitation Locations in Australia and New Zealand shows approximately 50% of programs are run in rural or remote locations. The type and effectiveness of these interventions is largely unknown. Some authors suggest that service models used in these communities must take account of the specific geographical, social, economic and cultural contexts of rural and remote communities¹³. The purpose of this review is to explore the type and cost effectiveness of COPD management interventions located in rural or remote settings of Australia or New Zealand in order to inform and influence planning for ongoing service development in the authors' local health district.

Method

This review considered COPD interventions set in rural or remote locations in Australia or New Zealand, defined using the Rural, Remote and Metropolitan Areas (RRMA) Classification¹⁴. Included studies were set in locations classified as rural zones 1–3 or remote zones 1 or 2. Studies were considered if they provide a non-pharmaceutical, disease management intervention for people with COPD, for example home-based nursing interventions (post-acute, long-term support), community-based support programs, telehealth interventions, pulmonary rehabilitation programs, education or self-management interventions. Interventions were required to be disease specific or, if part of a generic chronic disease program, specifically target people with COPD, and report outcome measures of health resource



utilisation such as emergency department (ED) presentations, inpatient admissions or length of stay.

Using four key search domains derived from the research question (COPD, models of care, rurality and Australia and New Zealand), search terms were developed to search Medline, Premedline, Scopus, Proquest, Cinahl and Informat databases as well as Google Scholar to find literature relevant to the topic of interest. The reference lists of identified literature were also searched for further relevant studies.

Results

Study selection

Figure 1 shows the selection process for inclusion in the review. Of the 107 records identified, 76 were excluded based on title, 24 excluded based on abstract and 5 excluded after full paper review. The two remaining studies were included in the review.

Study characteristics

Study characteristics are summarised in Table 1. While both studies were set in a rural location and provided a program for the management of COPD, there were no similarities in the interventions provided; one focused on exercise training while the other provided a telehealth monitoring intervention.

Study quality

Both studies had a small sample size, and randomisation of subjects to control or intervention groups was poor.

Factors limiting the methodological quality of the Venter study¹⁶ included that the study included patients with a diagnosis of COPD or chronic heart failure; however, the number of subjects with each diagnosis or severity of disease was not specified. Forty percent (4/10) of the control group did not survive at 6 months and these subjects were replaced

with matched subjects to complete the 12-month study period. Large differences existed in the baseline values of control and intervention groups for ED attendances, inpatient admissions and inpatient bed days. Outcomes were measured based on percentage change from baseline, with no statistical analysis performed, and it was not possible to determine level of significance.

Table 2 summarises outcomes related to health resource utilisation of the two studies.

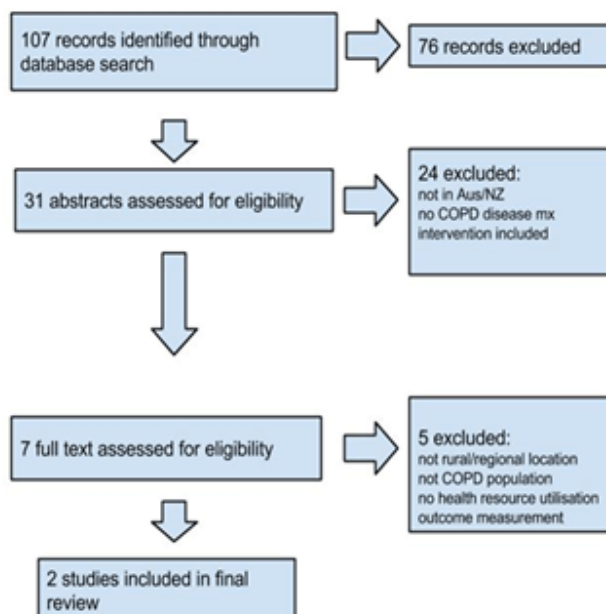
Effect of intervention on outcome

Table 2 summarises the findings of the two studies reviewed. Both interventions appear to positively influence a reduction in both ED presentation and inpatient admissions over a 12 month period. Interestingly, Rasekaba et al¹⁷ found that town of residence was a predictor of participation in the intervention they offered; participants living in outlying areas were less likely to participate.

While both studies have provided some evidence of their interventions resulting in a reduction in health resource utilisation, the lack of homogeneity between the two interventions does not allow any further comparisons or conclusions to be drawn.

Discussion

This review aimed to explore the type and cost effectiveness of COPD management interventions for people living with COPD in rural or remote areas of Australia or New Zealand. The limited literature, as well as a lack of homogeneity within the literature, has resulted in no definitive findings being drawn from this review. It has highlighted a need to review the key success factors for COPD management interventions internationally and in urban Australia and New Zealand and determine the transferability of intervention design to rural areas.



COPD, chronic obstructive pulmonary disease.

Figure 1: Flow diagram¹⁵ showing the process of study selection in a systematic review of the availability and cost effectiveness of chronic obstructive pulmonary disease management interventions in rural Australia and New Zealand.

Table 1: Characteristics of studies^{16,17} included in a systematic review of the availability and cost effectiveness of chronic obstructive pulmonary disease management interventions in rural Australia and New Zealand (n=2)

Study	Setting and study type	Population	Intervention	Outcomes measured	Results
Rasekaba, et al (2009)	Australia: Kyabram (population 5260) Chronic disease management pulmonary rehabilitation program Observational study Prospective cohorts	29 intervention, 24 opt-out subjects All subjects had COPD (forced expiratory volume1/forced vital capacity < 70%) No cardiac co-morbidity Accessible medical records	Exercise and education program 1 session per week for 8 weeks Individually tailored. Ongoing access to community based exercise program	COPD-related ED presentations Inpatient admissions Length of stay Costs associated with health care utilisation	Statistically significant decrease in ED presentations, admissions and length of stay for intervention group Town of residence – predictor of participation in program
Venter, et al (2012)	New Zealand: Turangi or Taupo (population 32 421) Telehealth pilot study with quantitative and qualitative data	10 control, 10 intervention subjects All subjects had a diagnosis of COPD or chronic heart failure, inpatient admission in previous 12–24 months Balance of Maori/non-Maori	Telehealth terminal monitored by nurses who contacted patients if necessary. Both groups received Healthright (nurse-led disease management program with regular home visits, assessment and care planning)	ED presentations Inpatient admissions Length of stay General practitioner visits Qualitative interview data	Authors concluded that Intervention showed no reduction in health service utilisation; however, both groups did show a decline in inpatient admission rates over 12 months. Consistent trend toward improved quality of life with intervention

COPD, chronic obstructive pulmonary disease. ED, emergency department.



Table 2: Summary of outcome statistics from a systematic review of the availability and cost effectiveness of chronic obstructive pulmonary disease management interventions^{16,17} in rural Australia and New Zealand (n=2)

Study	ED presentations (no. of episodes) at 12 months Mean±SE			Length of stay (no. of days) at 12 months Mean±SE			Inpatient admissions (no. of episodes) at 12 months Mean±SE		
	Intervention	Non-intervention	p value	Intervention	Non-intervention	p value	Intervention	Non-intervention	p value
Rasekaba, et al (2009)	0.07±0.05	0.88±0.18	<0.001	0.1±0.1	9.8±3.0	<0.001	0.07±0.05	0.96±0.24	<0.001
Venter, et al (2012)	1.42 (-6% from baseline)	0.96 (+5% from baseline)	not reported	3.27 (+9% from baseline)	3.41 (+2% from baseline)	not reported	1.36 (-25% from baseline)	0.75 (-19% from baseline)	not reported

ED, emergency department. SE, standard error.

The authors included studies that reported on interventions specifically targeting people with COPD living in rural or remote locations in Australia or New Zealand. These countries share a common guideline for the management of COPD, specified by the Thoracic Society of Australia and New Zealand¹⁵, which means interventions in the review were more likely to fall within the COPDX guidelines and be relevant to the investigators' practice. While reviewing only literature based in rural or remote areas substantially limited the scope of the review, it was recognised that the context of rural health is geographically, sociologically and demographically different to metropolitan settings¹⁸. People with COPD in rural settings have different experiences relating to the management of their health in comparison to those in urban settings¹⁹. These experiences include poorly coordinated care, difficulty accessing specialist care and inadequate information sources and support services¹⁹.

Limiting the scope of this review to include only studies that had outcomes related to health resource usage further reduced the number of studies available for review. Including studies measuring outcomes related to patient experiences and quality of life may have given a wider range of interventions available for review and a greater understanding of patient-related issues. Evaluation of these factors are particularly relevant in a rural and remote setting, where more complex issues relating to accessibility and coordination of services are known to exist. However, planning for new health services in rural and remote communities must consider financial efficiency as well as clinical effectiveness,

particularly as hospital services in rural and remote areas face higher fixed costs of operation. The present review did not specifically address issues related to indigenous health as these were not raised in the studies that met inclusion criteria. Other factors having the potential to impact on care received by those with COPD in rural and remote areas, such as the knowledge and skills of health practitioners²⁰, were not considered.

Other components of care reported in the reviewed studies, but not directly examined as part of the intervention, were identified as having potentially significant influences on outcomes. For example, Rasekaba et al¹⁷ proposed that ongoing support received by the intervention group via linkage with a community-based exercise program may have played an important role in reducing health resource utilisation over the intervention period. Venter et al¹⁶ suggest that the ongoing support provided to intervention and control groups via a nurse-led disease management program (regular home visiting, systematic assessment and care planning) may have masked any effect of the telehealth intervention.

Multidisciplinary, multi-treatment disease management programs for COPD have been shown to be an effective way of reducing health resource utilisation in COPD populations internationally^{11,12}. Adams et al's²¹ systematic review of the use of Wagner's chronic care model in COPD management identified that interventions combining an extensive self-management program, with individualised action plan,



advanced access to care from a knowledgeable healthcare provider, guideline-based therapy, and a clinical registry system resulted in reduced healthcare use. Based on the findings of this review, this model may provide an appropriate structure from which rural and remote services could be developed. The current review revealed insufficient evaluation exists regarding the cost effectiveness of either single or multifaceted approaches to the management of COPD in rural and remote settings of Australia or New Zealand.

The present review was limited by the availability of literature specific to this area and small sample sizes within each of the studies reviewed, a common limitation of healthcare research in rural populations. Unpublished data (Casemix, NSW Ministry of Health) from a facility within a rural health setting currently using an integrated approach to the management of chronic respiratory disease have shown positive outcomes in reducing COPD hospital admissions, readmissions and length of stay. The service offers home visits by nurses and allied health, access to COPD clinics with specialist care, smoking cessation, medication reviews and pulmonary rehabilitation. Further evaluation of this service is warranted to determine its effectiveness in a rural setting.

Conclusions

This review demonstrates a lack of information regarding both care models available for rural and remotely located people with COPD and their cost effectiveness in relation to health resource utilisation. While the included studies reported on only a single intervention, both authors noted that concurrent, uninvestigated interventions may have played a significant role in the outcomes achieved. Approximately 50% of pulmonary rehabilitation programs in Australia and New Zealand are situated in rural and remote settings; however, only two have reported outcomes related to cost effectiveness. There is a need for existing programs to report outcomes in a consistent and coordinated manner so that health resource utilisation can be measured.

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References

- 1 World Health Organization. Chronic respiratory diseases – chronic obstructive pulmonary disease. 2016. Available: <http://www.who.int/respiratory/copd/en/> (Accessed 5 July 2016).
- 2 Australian Institute of Health and Wellbeing. COPD – chronic obstructive pulmonary disease. 2016. Available: <http://www.aihw.gov.au/copd/> (Accessed 5 July 2016).
- 3 Health Navigator Trust. COPD costs NZ \$192m a year. 2015. Available: <http://www.healthnavigator.org.nz/news/2015/04/07/copd-costs-nz-192m-a-year/> (Accessed 5 July 2016).
- 4 Agusti A, Calverley PM, Celli B, Coxson HO, Edwards LD, Lomas DA, et al. Characterisation of COPD heterogeneity in the ECLIPSE cohort. *Respiratory Research* 2011; 11: 122. <https://doi.org/10.1186/1465-9921-11-122>
- 5 Jackson BE, Coultas DB, Suzuki S, Singh KP, Bae S. Rural–urban disparities in quality of life among patients with COPD. *Journal of Rural Health* 2013; 29(1): s62-s69.
- 6 Statistics New Zealand. A changing New Zealand . 2002. Available: http://www.stats.govt.nz/browse_for_stats/people_and_communities/households/changing-nz.aspx#the (Accessed 5 July 2016).



- 7 Australian Bureau of Statistics. 3218.0 – regional population growth, Australia, 2012–13. 2015. Available: <http://www.abs.gov.au/ausstats/abs@.nsf/products/AC53A071B4B231A6CA257CAE000ECCE5?OpenDocument> (Accessed 5 July 2016).
- 8 Australian Institute of Health and Wellbeing. Rural health. 2016. Available: <http://www.aihw.gov.au/rural-health> (Accessed 5 July 2016).
- 9 National Rural Health Alliance. Fact sheet 9: the state of rural health. 2009. Available: http://ruralhealth.org.au/sites/default/files/fact-sheets/fact-sheet-09-the-state-of-rural-health_0.pdf (Accessed 5 July 2016).
- 10 Disler RT, Inglis SC, Davidson PM. Cochrane overview: comprehensive approaches to chronic obstructive pulmonary disease management. A23 Not a second time: solutions to COPD readmissions and care management. In: American Thoracic Society International Conference Abstracts, May 17–20 Denver, Colorado. New York: ATS Journals, 2015; A1113-A.
- 11 Kruis AL, Smidt N, Assendelft WJ, Gussekloo J, Boland MR, Rutten-van Molken M, et al. Cochrane corner: is integrated disease management for patients with COPD effective?. *Thorax* 2014; 69(11): 1053-1055. <https://doi.org/10.1136/thoraxjnl-2013-204974>
- 12 Peytremann-Bridevaux I, Staeger P, Bridevaux PO, Ghali WA, Burnand B. Effectiveness of chronic obstructive pulmonary disease-management programs: systematic review and meta-analysis. *American Journal of Medicine* 2008; 121(5): 433-443.e4. <https://doi.org/10.1016/j.amjmed.2008.02.009>
- 13 Wakerman J, Humphreys JS. Rural health: why it matters. *Medical Journal of Australia* 2002; 176(10): 457-458.
- 14 Australian Institute of Health and Wellbeing. Rural, Remote and Metropolitan Areas (RRMA) classification. 2016. Available: <http://www.aihw.gov.au/rural-health-rrma-classification> (Accessed 5 July 2016).
- 15 Yang IA, Dabscheck E, George J, Jenkins S, McDonald CF, McDonald V, Smith B, Zwar N. The COPD-X Plan: Australian and New Zealand Guidelines for the management of chronic obstructive pulmonary disease. Version 2.50. 2017. Available: <http://copdx.org.au/copd-x-plan/> (Accessed 27 September 2017).
- 16 Venter A, Burns R, Hefford M, Ehrenberg N. Results of a telehealth-enabled chronic care management service to support people with long-term conditions at home. *Journal of Telemedicine and Telecare* 2012; 18(3): 172-175. <https://doi.org/10.1258/jtt.2012.SFT112>
- 17 Rasekaba TM, Williams E, Hsu-Hage B. Can a chronic disease management pulmonary rehabilitation program for COPD reduce acute rural hospital utilization?. *Chronic Respiratory Disease* 2009; 6(3): 157-163. <https://doi.org/10.1177/1479972309104419>
- 18 Paliadelis PS, Parmenter G, Parker V, Giles M, Higgins I. The challenges confronting clinicians in rural acute care settings: a participatory research project. *Rural Remote Health* 2012; 12: 2017. Available: www.rrh.org.au (Accessed 5 July 2016).
- 19 Hopley M, Horsburgh M, Peri K. Barriers to accessing specialist care for older people with chronic obstructive pulmonary disease in rural New Zealand. *Journal of Primary Health Care* 2009; 1(3): 207-214.
- 20 Johnston CL, Maxwell LJ, Maguire GP, Alison JA. How prepared are rural and remote health care practitioners to provide evidence-based management for people with chronic lung disease?. *Australian Journal of Rural Health* 2012; 20(4): 200-207. <https://doi.org/10.1111/j.1440-1584.2012.01288.x>
- 21 Adams SG, Smith PK, Allan PF, Anzueto A, Pugh JA, Cornell JE. Systematic review of the chronic care model in chronic obstructive pulmonary disease prevention and management. *Archives of Internal Medicine* 2007; 167(6): 551-561. <https://doi.org/10.1001/archinte.167.6.551>