



JOURNAL CLUB

DECEMBER 2019 | KEY PAPER SUMMARIES

Exacerbation action plans for patients with COPD and comorbidities: a randomised controlled trial

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Eur Respir J. 2019;54:1802134

DOI: 10.1183/13993003.02134-2018

Chronic obstructive pulmonary disease (COPD) is caused by gradual destruction of the airways and alveoli, typically due to the inhalation of harmful gases and particles. Many patients do not experience COPD in isolation of other health problems and there is currently insufficient evidence concerning the implementation of self-management interventions.

COPD self-management aims to engage and support patients to independently manage their health through the use of individualised treatment plans. A critical part of self-management involves the implementation of COPD exacerbation action plans. These have been proven to improve the quality of life for patients experiencing COPD in isolation, by reducing the likelihood of future exacerbations and the risk of hospitalisation. This study compared the total number of COPD exacerbation days over 12 months in two groups of patients with one or more co-morbidities (Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification II–IV). The comorbidities considered were: ischaemic heart disease, heart failure, diabetes, anxiety and depression. Each group was either trained in using symptom-based exacerbation action plans (self-management group; n=102) or received usual care (UC; n=99).

No significant differences in the number of COPD exacerbation days per patient per year were observed between the self-management and usual care group (self-management: median 9.6; UC: median 15.6; p=0.546). Despite this, in the self-management group, significant reductions were found in the duration of exacerbations (Self-management: median 9.1 days; UC: median 9.5 days; p=0.348) and the probability of having a respiratory-related hospitalisation during follow-up (relative risk 0.55; p=0.008). No between-group differences were observed in the total number of hospitalisations (Incidence Rate Ratio (IRR) 1.07 (95% confidence interval 0.66; 1.72)) or in mortality rates (self-management: n=4 (3.9%); UC: n=7 (7.1%); relative risk 0.55). These results suggest using a patient-tailored approach including individual assessment of COPD and comorbidities, exacerbation action plans and motivational feedback from a supportive case manager may be beneficial to patients experiencing co-morbid COPD.

Outdoor air pollution and the burden of childhood asthma across Europe

Khreis H, Cirach M, Mueller N, et al.

Eur Respir J. 2019;54:1802194

DOI: 10.1183/13993003.02194-2018

Asthma is a chronic disorder of the airways that affects more than 334 million people worldwide and is often cited as the most prevalent chronic disease in children. A recent systematic review and meta-analysis has suggested that air pollution may contribute significantly towards the development of asthma. The present study estimated the number of new asthma diagnoses across 18 countries that could be attributable to common air pollutants. These included black carbon (BC), nitrogen dioxide (NO₂), particulate matter ≤2.5 µm in diameter (PM_{2.5}) and particulate matter ≤10 µm in diameter (PM₁₀).

The incident rates of children from 16 EU countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Portugal, Spain, Sweden and the UK) and 2 non-EU countries (Norway and Switzerland) were modelled onto areas of 1 km². Similarly, the average annual childhood exposures to NO₂, PM_{2.5} and BC were mapped onto areas of 1 km² using a validated hybrid LUR model. The LUR model uses information about land-use, geographic and traffic to explain spatial variations in air pollution. Two exposure reduction scenarios were tested: a) the values recommended by the annual World Health Organisation (WHO) air quality guideline and b) the minimum air pollution levels from 41 studies in the underlying meta-analysis.

It was estimated that compliance with the NO₂ and PM_{2.5} WHO guidelines would prevent 2434 (0.4%) and 66567 (11%) of new asthma diagnoses, respectively. Furthermore, reaching the minimum air pollution levels for NO₂ (1.5 µgm⁻³), PM_{2.5} (0.4 µgm⁻³) and BC (0.4 ×10⁻⁵ m⁻¹) was estimated to prevent 135257 (23%), 191883 (33%) and 89191 (15%) cases of asthma, respectively.

This study offers the most complete picture of the amount of incident childhood asthma attributable to 3 common air pollutants and suggests that the current NO₂ air quality guideline provides less protection than the PM_{2.5} guideline. There is no evidence that further reductions would not reduce incidence rates further. Therefore, both guidelines may require reductions to promote children's health.

Influence of Socioeconomic Deprivation on Short- And Long-Term Outcomes Of Home-Based Pulmonary Rehabilitation In Patients With Chronic Obstructive Pulmonary Disease

Grosbois J-M, Heluain-Robiquet J, Machuron F, et al.

Int J COPD. 2019;14:2441–49.

DOI: <https://doi.org/10.2147/COPD.S224348>

Pulmonary rehabilitation (PR) is an intervention used to improve dyspnoea, exercise tolerance, quality of life, anxiety and depression in chronic obstructive pulmonary disease (COPD), regardless of disease severity. Despite this, fewer than 10% of all COPD patients participate in PR programs. Many patients report that they are unable to engage in PR due to a lack of available environmental resources such as transportation and social support. Socio-economic disadvantages, smoking status and the degree of physical impairment have also been shown to have an influence. Home-based PR may offer an innovative intervention that overcomes the issue of accessibility and provides officious treatment regardless of socioeconomic deprivation.

This observational study retrospectively analysed data from 459 COPD patients categorised as either socially deprived or non-socially deprived based on a cut-off of 30.17 on the Evaluation of Deprivation and Inequalities in Health Centres (EPICES) questionnaire. Patients received weekly PR sessions, composed of retraining exercises, physical activities, therapeutic education and psychosocial and motivational support. Exercise tolerance, levels of anxiety and depression, and quality of life were assessed using the 6 min stepper test (6MST), Hospital Anxiety and Depression Scale (HADS), and Visual Simplified Respiratory Questionnaire (VSRQ). Measurements were taken before the PR program, then at 2, 4, and 8 months following treatment.

This study found that the socially deprived group were younger, more likely to be women, active smokers or living alone. The socially deprived group also had more severe depression and anxiety compared with the non-socially deprived group. Before treatment, 6MST, VSRQ, and HADS measures were lower for the socially deprived than the non-socially deprived group. The benefits of PR were sustained in both socially deprived and non-socially deprived individuals at 2, 8, and 14-month follow-up, with no significant differences in any of the outcome variables between groups. The percentage of patients showing clinically important improvements was the same in both groups. This suggests home-based PR could be an effective intervention in patients with COPD regardless of socioeconomic status.

Cost saving of switching to equivalent inhalers and its effect on health outcomes

Bloom CI, Douglas I, d'Ancona G, et al.

Thorax. 2019;74(11):1078–86.

DOI: [10.1136/thoraxjnl-2018-212957](https://doi.org/10.1136/thoraxjnl-2018-212957)

In the UK, over 1.2 million people have a diagnosis of chronic obstructive pulmonary disease (COPD) and over 5.4 million people receive asthma treatment (estimations from 2012). Due to the high prevalence of respiratory diseases, 3 of the top 5 most expensive drugs in the National Health Service (NHS) budget in terms of total prescription costs are inhalers. Over £1.1 billion of the NHS budget is spent on asthma, with an additional £800 million spent directly on COPD. Switching inhalers to a cheaper alternative is often advocated as a cost-saving strategy despite the impact on patient's health being unknown.

This study assessed the UK primary healthcare records of patients with asthma and chronic obstructive pulmonary disease (COPD) between 2000 and 2016. This study employed a self-controlled design by comparing patients at a time of risk (during the 3-month period after switching inhalers) to a time of reduced risk (pre-switch or post-adaptation their new prescription). Four outcomes were assessed: disease exacerbations, general practitioner consultations, non-specific respiratory events and adverse-medication events. Medication possession ratio (MPR) was calculated to assess adherence to treatment. The cost differences per equivalent dose were calculated from the 2017 National Health Service prices.

2% of the identified asthma inhaler users and 6% of the COPD inhaler users switched prescription. Inhaler switches between a brand-to-generic inhaler, and all other switches (brand-to-brand, generic-to-generic, generic-to-brand), were associated with reduced exacerbations (brand-to-generic: IRR=0.75, 95%CI 0.64 to 0.88; all other: IRR=0.79, 95%CI 0.71 to 0.88). No differences in gender, age, therapeutic class, inhaler device and inhaler-technique checks were found between the groups. The rate of consultations, respiratory-events and adverse-medication events did not change significantly (consultations: Incidence Rate Ratio (IRR)=1.00, 95%confidence interval (CI) 0.99 to 1.01; respiratory-events: IRR=0.96, 95%CI 0.95 to 0.97; adverse-medication-events: IRR=1.05, 95%CI 0.96 to 1.15). Adherence significantly increased post-switch (median MPR: pre-switch=54%, post-switch=62%; $p<0.001$). The temporary reduction in exacerbations may have been due to increased medication understanding.

The results suggest that financially driven switching occurs infrequently due to the belief that inhalers are not interchangeable. In contradiction, this study has shown that switching to an equivalent inhaler in patients with asthma or COPD appears to be safe and did not negatively affect patient's health or healthcare utilisation, as only 5% of patients did not stay on their new inhaler. Additionally, switching inhalers could reduce the cost of treatment by £6 million. These findings have important clinical implications

and could help redirect the respiratory healthcare budget towards more efficacious recipients. However, the study results must be interpreted with caution as data was not reported on whether the switch to a different inhaler was performed face to face, by phone or by letter. All medication changes should be performed with the patient face to face, while clinicians should also use the time with the patient to ensure that they are able to use their new therapies and understand the reasons behind the change.

Inhaled corticosteroids in COPD and onset of type 2 diabetes and osteoporosis: matched cohort study

Price DB, Voorham J, Brusselle G, et al.
npj Prim Care Resp Med. 2019;29(1):38.
 DOI: 10.1038/s41533-019-0150-x

Identification of the most suitable chronic obstructive pulmonary disease (COPD) patients for treatment with inhaled corticosteroids (ICS) remains an important research topic. In addition, the adverse effects of ICS treatment for COPD requires further investigation. Commonly assumed adverse effects associated with ICS in COPD are pneumonia, skin bruising, oropharyngeal candidiasis, voice hoarseness and tuberculosis. Other less tenuous adverse effects include increased risk of diabetes, poor control of diabetes, fractures and decreased bone density. There is mixed evidence from cohort studies about the onset and progression of diabetes, particularly at higher ICS doses. Similarly, discordant results have been published for the association of ICS with risk of fractures. This study set out to assess the relationship between ICS treatment and diabetes onset, diabetes progression and osteoporosis onset.

This matched cohort study used two large UK databases to study patients (≥ 40 years old) initiating ICS or long-acting bronchodilator (LABA) for COPD from 1990–2015. The relationship between ICS treatment and diabetes onset ($n=17,970$), diabetes progression ($n=804$), and osteoporosis onset ($n=19,898$) was explored by comparison with LABA treatment. The median follow-up was 3.7–5.6 years/treatment group. For patients receiving ICS, the risk of diabetes onset was significantly increased in comparison to patients receiving LABA (adjusted hazard ratio 1.27). No increased risk was found with regards to diabetes progression (adjusted hazard ratio 1.04) or the onset of osteoporosis (adjusted hazard ratio 1.13). For patients new to ICS treatment, this study found dose–response relationships for increased risk of diabetes onset, diabetes progression, and onset of osteoporosis at mean daily exposures of $\geq 500\mu\text{g/day}$.

The results of this study suggest long-term ICS therapy for COPD at mean daily exposure of $\geq 500\mu\text{g}$ is associated with an increased risk of diabetes, diabetes progression and osteoporosis. These findings add to the evidence suggesting

careful attention must be applied when prescribing ICS to patients at risk of diabetes, osteoporosis and other comorbidities and, when prescribed, ICS should be prescribed in the minimum possible dose.

Assessing asthma control: comparison of electronic-recorded short-acting beta-agonist rescue use and self-reported use utilizing the asthma control test

Anderson W, Gondalia R, Hoch H, et al.
J Asthma. 2019;9:1–5
 DOI: 10.1080/02770903.2019.1687715

The increased use of short-acting beta-agonists (SABA) in adults and adolescents with asthma is correlated with suboptimal disease control and is an independent predictor of exacerbations. The National Heart, Lung, and Blood Institute National Asthma Education and Prevention Program Expert Panel 3 (EPR-3) defines not well-controlled asthma as SABA use on >2 days per week and defines very poorly controlled asthma as SABA use several times per day. The Global Initiative for Asthma (GINA) defines uncontrolled asthma based on SABA use more than twice per week. The Asthma Control Test (ACT) provides a validated assessment of control. Question 4 (Q4) of the ACT asks patients to report how many times over the previous 4 weeks they have administered SABA. However, imprecise or biased recall of past SABA use could lead to a misclassification of patients. The aim of this study was to determine whether all 5 questions of the ACT are required or whether Q4 is sufficient to evaluate patient control of asthma.

1,062 adults with a self-reported diagnosis of asthma were enrolled in a digital health electronic medication monitoring (EMM) platform. The EMM platform automatically recorded the date and time of SABA administrations and prompted completion of the ACT. Higher ACT Q4 scores, indicating lower SABA use, were negatively correlated with actual SABA use as recorded on the EMM ($p=-0.59$). 35% percent of patients underreported SABA use when comparing Q4 to EMM-recorded SABA use.

The high rates of underreporting in this study highlight the need for objective measures of SABA use in asthma control assessments. The ability of EMMs to provide passively collected objective data minimises potential recall error. Therefore, the use of EMM-recorded SABA data has the potential to enable more accurate assessment of asthma control, guide possible changes to treatment and estimate short-term exacerbation risk. This study adds to our understanding of the relationship between self-reported and objective SABA use, and may be helpful when incorporated into clinical practice.



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The Primary Care Respiratory Academy is sponsored by *Boehringer Ingelheim*, *Chiesi*, *GlaxoSmithKline* and *Orion Pharma*.