Bronchiectasis Economics: Spend Money to Save Money

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Bronchiectasis is a very heterogeneous disease with a large number of possible etiologies and a wide variety of clinical presentations that can range from asymptomatic patients with infrequent exacerbations to patients with daily severe symptoms and recurrent or chronic airway infections and hospitalizations [1]. Logically, the more severe spectrum is what most caregivers see and what research focuses on. What lies beneath is a complex expanse of physical, social, psychological, familial, and economical aspects, which together define the disease status of the individual patient. Recent data suggests that the prevalence and hospitalization rate of bronchiectasis is increasing [2, 3]. This increased burden of bronchiectasis on healthcare is without doubt associated with increasing economic costs.

Different levels of disease costs can be unraveled. Most data focus on the direct and obvious costs associated with bronchiectatic disease, more specifically, the costs of etiological workup and follow-up, the costs of exacerbations and hospitalizations, and the daily medical costs [4, 5]. Costs associated with the loss of quality of life and absenteeism as well as the burden put on the family and caregivers, to our knowledge, have not been taken into consideration previously. It is the merit of

de la Rosa Carrillo et al. [6] that the authors attempt to estimate these costs in this issue of *Respiration*. de la Rosa Carrillo et al. [6] collected data on employment, salary, the need for sick leave of the patient during the exacerbation, and the need for sick leave of the caregiver [6]. However, the indirect costs due to the loss of productivity seemed to be of little relevance in this study, mainly due to the age distribution. However, even these cost estimates are an underestimation of the real overall bronchiectasis-associated costs as outpatient physiotherapy, rehabilitation programs, home daily medication, insurance, lifestyle adjustment costs (e.g., working part-time due to illness) and comorbidity costs such as anxiety, depression, cardiovascular disease, or other comorbid respiratory conditions are not taken into account. Further research needs to attempt to encompass these financial aspects of bronchiectasis disease.

Due to a combination of an increasing prevalence and high economic costs, research has tried to analyze the factors that influence economic costs. This might then provide a basis upon which tailored interventions can be tested to not only improve bronchiectasis care but simultaneously reduce healthcare costs. As an example, Bedi et al. [7] investigated home intravenous antibiotic treat-

Fig. 1. Key aspects of bronchiectasis care and research. This patient-centered approach to bronchiectasis care and research considers different factors. This graph depicts some important aspects but does not aim to be exhaustive. The management of bronchiectasis itself and focused research on specific interventions is essential. There is an urgent need to unravel bronchiectasis heterogeneity. A detailed patient characterization is essential to identify new phenotypes and eventually better personalize treatment. With this, the management and understanding of influencing comorbidities are a key factor in both research and care of bronchiectasis patients. This implies that bronchiectasis care is teamwork and implies a multidisciplinary approach including the patient as a specialist of his own life [1]. Such an approach strives for more health per euro. Economic impact analysis of treatments is crucial but needs to be based on the individual patient needs.

ment in bronchiectasis patients. They showed that this intervention was safe, resulted in less morbidity, was as efficient as hospital-based treatment, and reduced the hospitalization days significantly, thus the healthcare costs.

Through economic analysis, other possible targets for cost reduction can be isolated. Previous research found several factors that augment disease costs in bronchiectasis: decreased FEV₁, increased age, a higher number of exacerbations, a higher number of hospital admissions, an increased disease severity measured by FACED, and *Pseudomonas aeruginosa* infection [8–11]. The latter is now strongly confirmed by de la Rosa Carrillo et al. [6] in this issue of *Respiration*. They found that patients with chronic bronchial infection by *P. aeruginosa* had more days in the hospital ward, a longer overall hospitalization period, and higher overall costs.

More and more evidence supports the notion that acquisition of *P. aeruginosa* hallmarks a turning point in the disease history of bronchiectasis patients. Recently,

Araújo et al. [12] established that *P. aeruginosa* was independently associated with exacerbation frequency, worse quality of life, and hospital admissions. They also found an increased mortality in the presence of exacerbations. de la Rosa Carrillo et al. [6] explored these costs and found a significant increase in the treatment costs in the few months after hospital discharge due to readmissions and emergency room visits.

All efforts at treating or eradicating *P. aeruginosa* could potentially reduce economic costs. It is essential to find therapeutic strategies that reduce the clinical impact of *P. aeruginosa* without increasing still further the overall healthcare expenses. Many countries are hampered in their daily quality care for patients with bronchiectasis due to the absence of reimbursement for mucoactive agents and inhaled antibiotics [13]. Governmental bodies argue that their costs are too high compared with the solidity of the evidence of their beneficiary effect. This has led to the current tragedy that patients in some countries with severe symptomatic and exacerbating bronchiecta-

sis have a lack of access to these therapies from which they might importantly benefit. Indeed, the lack of solidity of the evidence as judged by the authorities is most probably influenced by the heterogeneity and the small sample size of the included population in the randomized controlled trials to date [14–16].

Health has been defined as the ability to adapt and manage one's own wellbeing, in light of the physical, emotional, and social challenges in life [17]. Chronic diseases such as bronchiectasis are permanent, as they are caused by irreversible pathological changes. They may be expected to require a long period of supervision, observation, or care. Treatment goals include enhancement of the functional status, minimization of distressing symptoms, and enhancement of the quality of life. These are related to the principles of value-based healthcare, in which value is defined as patient health outcomes per euro spent. In healthcare, the measurement of value should focus on how well the care delivered meets individual patient needs. Indeed, health is a value on itself and it is also a precondition for economic prosperity in a broader sense as health influences productivity, labor supply, human capital, and public spending. Future research should consider both a broad economic outcome analysis but also a broad evaluation of patient health outcomes when testing

exacerbation reducing or *P. aeruginosa*-targeting treatments to prove that a treatment that might seem not overwhelmingly beneficial on predefined hard clinical outcomes nonetheless can be considered cost-effective. In addition, related to the complexity of the patient with a chronic disease such as bronchiectasis, these evaluations should also be positioned within the concepts of managed care, which focus on organizing healthcare providers to achieve the dual goal of controlling healthcare costs and managing the quality of care (Fig. 1).

In light of the more recent economic-based decisions in healthcare, bronchiectasis interventions should in our opinion focus on the factors that influence both general bronchiectasis health and costs. This will increase their chance of reimbursement and implementation into daily practice. Taking into consideration all current data, this means that we need to invest more in interventions that try to focus on *P. aeruginosa* control/eradication or exacerbation reduction. The big success of the bronchiectasis registries will undoubtedly cause a surge in successful trials as they will provide a basis to unravel disease heterogeneity, allow larger study populations, and cause better patient selection upon which new interventions focused on *P. aeruginosa* and exacerbations can be performed. In short, we need to spend money to save money [18, 19].

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