found that titrating inhaled corticosteroids using a combination of F_{ENO} and sputum eosinophils reduced exacerbation rates and asthma symptoms compared to a conventional strategy, without additional increases in inhaled corticosteroid doses.

In conclusion, serial F_{ENO} measurements may identify airway inflammation within close temporal proximity to changes in conventional biomarkers of eosinophilic disease such as sputum eosinophil count, with the added value of being of point-of-care. Further prospective trials are required to assess if this approach can successfully predict exacerbations or be used to titrate therapy in adults with asthma.

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Exhaled nitric oxide home monitoring is a promising surrogate marker of eosinophilic airway inflammation in asthma http://ow.ly/108ak4

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Quality standards for the management of bronchiectasis in Italy: a national audit

To the Editor:

Although historically considered a neglected disease, bronchiectasis has become a disease of renewed interest over recent decades in light of an increase in prevalence and a substantial burden on healthcare systems [1–3]. In 2010, the British Thoracic Society (BTS) published guidelines on the management of bronchiectasis in adults, along with specific quality standards [4, 5]. To date, these represent the only

quality standards available in Europe. These have been tested over a number of years in the UK with progressive improvements in the standard of care [6]. No national guidelines are available in Italy and no indications on which guideline should be followed have been given by the Italian Society of Respiratory Medicine (SIP). There are limited published data on the quality of bronchiectasis care in Europe outside of the UK. The BTS standards have not been tested in continental Europe or in Italy, where information on characteristics and management of bronchiectasis patients are lacking.

A national audit was conducted by the SIP on adult patients with bronchiectasis who attended secondary care clinics in 32 hospitals across Italy in 2014 and 2015. An invitation to participate in the audit was sent to the chiefs of pulmonary departments in Italy, as well as members of the SIP. They were asked to complete an electronic case report form (CRF) for each patient enrolled, concordant with the CRF used in the 2012 UK audit [6]. A total of 1361 records were submitted from 32 institutions across the country. The majority of the patients were female (n=719, 53%) and the median (interquartile range (IQR)) age was 70 (59–77) years. *Pseudomonas aeruginosa* was isolated at least once during the previous year in 20% of the patients, enteric Gram-negative organisms in 7.8% and methicillin-resistant *Staphylococcus aureus* (MRSA) in 2.9%. A total of 158 (12%) patients had a chronic infection with *P. aeruginosa*, defined as the presence of this pathogen in at least two consecutive sputum samples collected in stable state over 1-year period [7].

43% of the patients had two or more exacerbations per year, while 18% had three or more exacerbations per year, with a median (IQR) of 2 (2–3) exacerbations per year. 49% had been hospitalised at least once in the previous year for lower respiratory tract infections (LRTI). The median (IQR) number of antibiotic courses for LRTI in the previous year was 2 (2–3), with 40% of the study population receiving three or more antibiotic courses in the previous year. Specifically, 36% of them received at least one course of intravenous antibiotics because of an exacerbation during the previous year.

The prevalence of chronic infection with *P. aeruginosa* was lower than the prevalence of patients with two to three or more exacerbations or hospitalisations per year, and some explanations might be suggested for that. On one hand, we can speculate that frequent exacerbators are also those with either an intermittent infection with *P. aeruginosa* or chronic infections with other bacteria, as recently reported [8], and that microbiology is just one of several bronchiectasis features responsible for bad outcomes [7]. On the other hand, hospitalisations for LRTI in bronchiectasis patients might be also due to factors not strictly related to bronchiectasis and infection, such as the presence of decompensated comorbidities or failure of oral antibiotic therapy [9]. The rate of *P. aeruginosa* isolation (20%) in the present audit is very similar to the reported prevalence of *P. aeruginosa* in 21 cohorts recently included in a meta-analysis where the mean frequency of isolation was 21.4% [10]. We suspect that the frequency of *P. aeruginosa* may be underestimated due to a lack of regular sputum sampling in Italy (see later).

A total of 119 (9%) patients were on long-term antibiotic treatment, either orally or by inhalation. 7.8% had received long-term oral antibiotics for >28 days and among them, 74 were taking azithromycin, 11 levofloxacin, nine ciprofloxacin, three moxifloxacin, three trimethoprim/sulfamethoxazole, two clarithromycin and one amoxicillin/clavulanate. Only 1.1% of the patients had received long-term inhaled/nebulised antibiotics for >28 days. Among them, 10 were on tobramycin, three on colomycin and two on gentamicin. Four patients were on both oral and inhaled/nebulised long-term antibiotic treatment.

The BTS quality standard for the management of patients with bronchiectasis evaluated in the present audit comprises 10 statements. The adherence to these standards is depicted in figure 1.

In order to make a diagnosis of bronchiectasis, the first quality statement recommends a computed tomography (CT) of the chest using 1-mm slices. In this SIP audit, 93% of the patients had a CT scan, although only 46% had a high-resolution CT scan. Bronchiectasis was diagnosed by chest radiography in 5% and by bronchography in 1% of the rest of the population, while 1% had a clinical diagnosis alone. The second statement recommends that patients should be investigated for allergic bronchopulmonary aspergillosis (ABPA), common variable immunodeficiency (CVID) and cystic fibrosis (CF), the last of these if indicated, as these are specific and treatable causes of bronchiectasis [11]. In the SIP audit, only 435 (32%) patients were tested for at least one of the above: 17% of the patients had been investigated for ABPA, 22% for CVID and 5.5% for CF. Furthermore, 9.3% of patients were tested for IgG subclasses, 4.7% for HIV, 8.2% for α_1-antitripsin deficiency, 18% for autoantibodies and 2.6% for either saccharin test or electronic microscopy for ciliary dysfunction. Finally, no tests to investigate the aetiology of bronchiectasis were performed in 59% of the patients. The third and fourth statements require that people with bronchiectasis have sputum bacterial culture when clinically stable recorded at least once each year and at the start of an exacerbation before initiating antibiotics. 27% had at least one sputum sent for bacterial culture in stable state during the previous year and almost 50% at the beginning of an exacerbation. The fifth statement proposes that people with bronchiectasis are taught appropriate airway clearance techniques by a specialist respiratory physiotherapist

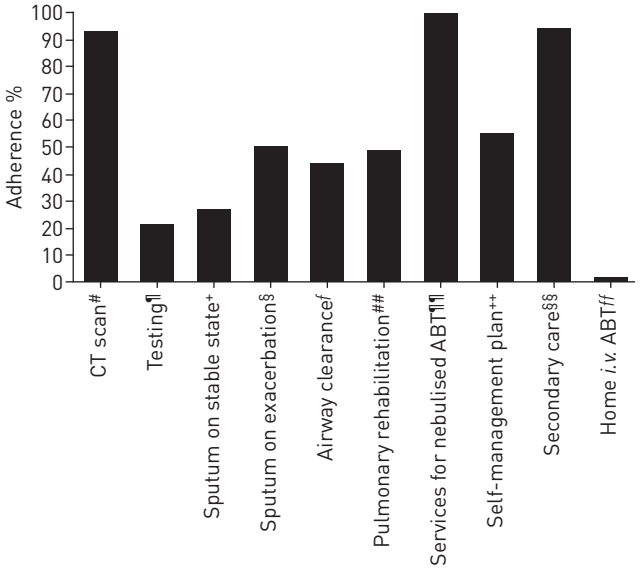

FIGURE 1 Summary of the quality statements for bronchiectasis in adults and percentage adherence in the Italian Society of Respiratory Medicine (SIP) Audit. #: people with a clinical diagnosis of bronchiectasis have the diagnosis confirmed by chest computed tomography (CT) scan (using 1 mm slices). ¶: people with bronchiectasis to be investigated for allergic bronchopulmonary aspergillosis, common variable immunodeficiency and cystic fibrosis (the last of these, if indicated), as these are specific treatable causes. +: people with bronchiectasis have sputum bacteriology culture when clinically stable recorded at least once each year. §: sputum is sent for bacterial culture at the start of an exacerbation before starting antibiotics; empirical antibiotic treatment to start as soon as feasible and not await the sputum culture results. *f*: people with bronchiectasis are taught appropriate airway clearance techniques by a specialist respiratory physiotherapist and advised of the frequency and duration with which these should be carried out. ##: people with bronchiectasis to attend pulmonary rehabilitation if they have breathlessness affecting their activities of daily living. ¶¶: services for people with bronchiectasis to include provision of nebulised prophylactic antibiotic therapy (ABT) for suitable patients supervised by a respiratory specialist. ++: people with bronchiectasis to have an individualised, written self-management plan. §§: people with bronchiectasis who meet the criteria for continuing secondary care to be managed by a multidisciplinary team led by a respiratory physician. *ff*: services for people with bronchiectasis to include provision of home intravenous ABT for exacerbations in selected patients.

and advised of the frequency and duration with which these should be carried out. In the SIP audit, only 44% of the patients were taught chest clearance techniques by a specialist respiratory physiotherapist. The sixth statement proposes that people with bronchiectasis and breathlessness affecting their activities of daily living should attend pulmonary rehabilitation, in order to improve their exercise capacity and health status. 49% of Italian patients had breathlessness and among those, 49% attended a pulmonary rehabilitation programme. The seventh statement requires that there should be provision of nebulised prophylactic antibiotics for suitable patients supervised by a respiratory specialist. All 20 patients receiving long-term nebulised antibiotics for >1 month were supervised by respiratory physicians using off-label treatment. The eighth statement is that people with bronchiectasis should have an individualised written self-management plan in order to manage their condition and to recognise, respond to and reduce the occurrence of exacerbations. In the SIP audit, 56% of the patients shared an individualised written self-management plan. The ninth standard is that people with bronchiectasis who meet the criteria for continuing secondary care should be managed by a multidisciplinary team led by a respiratory physician. These are patients with chronic *P. aeruginosa*, mycobacteria or MRSA, three or more exacerbations per year, receiving long-term antibiotic treatment, bronchiectasis associated with rheumatoid arthritis, immune deficiency, inflammatory bowel disease, primary ciliary dyskinesia or ABPA, and advanced disease, and/or considering lung transplantation. Among the 665 patients who met these criteria, the majority (94%) was seen by respiratory physicians at a secondary care level (20% were seen every 2 months, 32% every 4 months, 36% were seen 6-monthly and 12% once a year) and 6% by general practitioners. Furthermore, only four out of the 32 study centres participating in the audit have a specific bronchiectasis clinic taking care of 221 (16%) patients in total. The development of tertiary-care bronchiectasis clinics should be a priority at national level in order to offer the most severe patients a better and multidisciplinary management of their disease. The final statement concerns services for people with bronchiectasis, which should include provision of home *i.v.* antibiotic treatment for exacerbations in selected patients. In the audit, only 2.3% were offered domiciliary *i.v.* antibiotics. Only one out of 32 centres was able to offer a domiciliary treatment with *i.v.* antibiotics for an exacerbation.

The majority of the BTS recommendations for the management of bronchiectasis in adults were not met in Italy, with six out of 10 being reached in <50% of the patients. A lower percentage of patients undergoing high-resolution CT scan and standard testing for bronchiectasis aetiology is reported in the present SIP audit in comparison to the 2012 UK audit [6]. Five more areas require particular attention, including: monitoring sputum bacteriology; promoting airway clearance taught by a specialist respiratory physiotherapist and pulmonary rehabilitation in selected patients; and developing services to allow domiciliary intravenous antibiotic treatment [12]. Possible reasons for low adherence to the quality standards include the absence of Italian and European guidelines, and lack of awareness of the disease and of the evidence base to support recommendations. Following the results of this audit, we suggest, on one hand, increasing educational activities on bronchiectasis at a national level according to the Harmonising Education in Respiratory Medicine for European Specialists (HERMES) curriculum and promoting access to the HERMES diploma, and on the other hand, to develop and subsequently implement national or European guidelines. Results of this intervention might lead to a better care of our patients, as the third UK audit demonstrated in comparison to the previous ones [6]. One tool to monitor the implementation of standard operating procedures in Italy will be the SIP national registry of adult patients with bronchiectasis that has been recently developed and linked to the EMBARC European registry [13].

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The majority of the quality standards for the management of bronchiectasis in adults are not met in Italy http://ow.ly/YKMpU

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