Risk of fall in patients with COPD

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ABSTRACT
A matched cohort study was conducted to determine the incidence of falls in patients following a diagnosis of COPD using a UK primary care database. 44 400 patients with COPD and 175 545 non-COPD subjects were identified. The incidence rate of fall per 1000 person-years in patients with COPD was higher (44.9; 95% CI 44.1 to 45.8) compared with non-COPD subjects (24.1; 95% CI 23.8 to 24.5) (P<0.0001). Patients with COPD were 55% more likely to have an incident record of fall than non-COPD subjects (adjusted HR, 1.55; 95% CI 1.50 to 1.59). The greater falls risk in patients with COPD needs consideration and modifiable factors addressed.

INTRODUCTION
The morbidity and mortality associated with COPD pose a public health challenge with a high economic burden.[1] The prevalence of falls has been reported to be greater among patients with COPD.[2] Two previous small studies, both <100 subjects, reported almost half of the patients had fallen in the preceding year.[3 4]

Risk of falls usually encompasses the complex interaction of several risk factors[5]; some of which are common, if not more problematic, in patients with COPD, including impaired balance control and skeletal muscle dysfunction.[3 6] There is little consideration of falls risk in COPD in guidelines.[5 7] The purpose of this study was to determine the incidence of coded recording of a fall in patients following a diagnosis of COPD in a matched cohort study within The Health Improvement Network (THIN) primary care database in the UK.

METHODS
The study population comprised individuals aged ≥35 years who had a new diagnosis of COPD between 1 January 2000 and 4 May 2014. The index date was the date of the first recorded COPD diagnosis. Up to four non-COPD individuals were matched with each patient with COPD based on sex, age within 1 year of the index date and general practice, and were assigned the same index date as their matched cases.

Potential confounders included age (<65, 65–79, ≥80 years old), gender and socioeconomic status (quintile of the Townsend Index of Deprivation). Clinical covariates included the most recent body mass index (BMI) (categorised as BMI≤20, BMI>20 kg/m^2 or missing), most recent cigarette smoking status (never, ex-smoker, smoker, unknown), and history of any of the following fall risk factors before the index date including but not limited to sight impairment, depression, cerebrovascular accident, heart failure, peripheral vascular disease, coronary heart disease, arrhythmia, dizziness and dementia.[5] Recorded medications that were considered as fall risk factors were also identified; these included but not limited to sedatives, diuretics and antidepressants.[5] More details are described in the online supplementary material (OLS). Medication episodes were constructed for each participant, and the exposure time was divided into periods of non-exposed periods and exposed periods. Exposed periods were started from the medication dispensing date until the first gap of more than 90 days between prescriptions. Medications started within 90 days prior to the index date were considered within the exposed period. Records of medications initiated more than 90 days prior to the index date were not considered in the analysis.

The demographic and clinical characteristics of the patients with COPD and non-COPD subjects were examined using χ^2 tests. The first recorded fall event following the index date was considered. Multivariable Cox proportional hazard model was used to evaluate the association between COPD and fall, as well as a complete case analysis. Person-time commenced at the index date and ended when a fall was experienced or when patients died or left a contributing general practice, whichever occurred first. Each of the confounders that changed the association between fall and COPD by 5% was included in multivariate Cox regression model, which allowed for the matched cohort. Data management and statistical analysis were performed using Stata V.13.

RESULTS
The study included 44 400 patients diagnosed with COPD and 175 545 non-COPD subjects. COPD and non-COPD subjects had similar median follow-up time (median 4.2 years, IQR 1.8–7.4; and median 4.1 years, IQR 1.7–7.5, respectively). The clinical features of the study population are presented in table 1 (further details in the online supplementary material (OLS)). The population had a mean (SD) age of 66.8 (11.4) years, and 53% were men. Of patients with COPD, 37% were current smokers, as were 15% of the non-COPD subjects. Of the patients with COPD, 10 646 (24%) had a doctor-recorded fall after the index date, compared with 22 117 (12%) of the non-COPD subjects. The incidence rate of fall in patients with COPD was 44.9 per 1000 person-years (95% CI 44.1 to 45.8) and in non-COPD subjects was 24.1 per 1000 person-years (95% CI 23.8 to 24.5). The time to first recorded fall was significantly different between the patients with COPD and non-COPD subjects (P<0.0001) (figure 1). Patients with COPD were 47% more likely to have a record of incidence of fall than non-COPD subjects (adjusted HR (aHR), 1.47; 95% CI 1.43 to 1.51), after adjusting for smoking
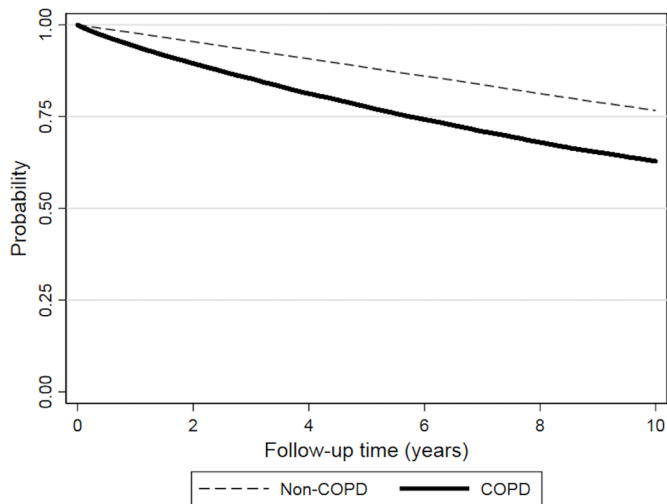
Figure 1 Kaplan-Meier analysis of incidence of time to first fall in patients with COPD and non-COPD.

status, use of antidepressants and diuretics. In the complete case analysis the results were similar (n=39 681 COPD vs 144 058 non-COPD, aHR 1.55; 95% CI 1.50 to 1.59) after adjusting for the same confounders.

DISCUSSION

The coded incidence rate of falls was significantly greater among patients with COPD compared with non-COPD subjects from the THIN primary care database, even after consideration of adjustment for age, gender and other confounding factors. This was the

first study that investigated the incidence of falls in patients with COPD and which considered other fall risk factors.

A number of factors likely to contribute to falls in the elderly are of even more relevance in patients with COPD. These include impaired balance and skeletal muscle dysfunction,[8 9] but might also include cognition, tremulousness and vision, and skeletal muscle dysfunction.[5 7] Given the high incidence of fall in COPD and the consequences of falls on mobility, quality of life and injury-related mortality,[10] assessment of falls risk is important to identify modifiable factors.

A strength of this study is that the primary care data are a large, representative sample cohort of patients with COPD within the UK. However, the actual incidence of falls might be underestimated because of the possibility that patients who experienced minor fall may not have reported to the general practitioner, and some incidence might not be recorded or recorded as free text. Another limitation is that this study is based on READ-coded COPD diagnosis. READ-coded spirometry confirmation at time of diagnosis is not consistently available. Finally, this analysis focused on the first recorded fall and does not consider repeat falls for the same patient.

To conclude, the study demonstrated an increased risk of recorded falls in patients with incident diagnosis of COPD. Further falls risk assessment might be indicated in patients with COPD with opportunity to address modifiable factors.

Table 1 Baseline characteristics of patients with COPD and non-COPD subjects

Characteristics	COPD, n=44 400	Non-COPD, n=175 545
Age at diagnosis, mean (SD) years	67.1 (11.4)	66.8 (11.4)
Gender, n (%)		
Male	23 509 (52.9)	92 981 (52.9)
Female	20 891 (47.1)	82 564 (47.1)
Townsend quintile, n (%)		
1 least deprived	6890 (15.5)	39 167 (22.3)
2	7585 (17.1)	37 957 (21.6)
3	8937 (20.1)	34 992 (19.9)
4	10 297 (23.1)	32 518 (18.5)
5 most deprived	9222 (20.7)	24 787 (14.1)
Not recorded	1472 (3.3)	6124 (3.5)
Most recent smoking status, n (%)		
Never	4773 (10.7)	84 184 (47.9)
Ex	21 983 (49.5)	55 599 (31.7)
Current	16 497 (37.1)	27 349 (15.6)
Not recorded	1147 (2.5)	8424 (4.7)
Most recent body mass index, n (%)		
≤20 kg/m^2	5578 (12.5)	9541 (5.4)
>20 kg/m^2	36 722 (82.7)	149 065 (84.8)
Not recorded	2100 (4.7)	16 939 (9.6)

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