Supplementary Methods

Database/population

The National Asthma and COPD Audit Programme (NACAP) reports care received by patients admitted to hospitals in England and Wales for acute exacerbations of COPD (AECOPD). In 2017 the audit switched to continual data collection. All acute hospitals in England and Wales were eligible to participate (Scotland joined the audit in 2018), and out of 197 eligible hospitals, 182 (92%) participated in data collection. The first report on these prospective data was published in 2018 including analysis for patients discharged between commencement of the audit and 13/09/2017. Further details of the audit methodology and results can be found in the published report(1) and a paper describing the longitudinal evolution of national COPD audit in the UK(2).

In 2019, a follow-up report was published. In this, longer-term outcomes – 30- and 90-day mortality and readmission – of the admissions included in the original 2017 audit report were assessed. All patients admitted to audit-participating hospitals for AECOPD on or after 01/02/2017 and discharged by 13/09/2017 had details of their admission linked with mortality data from the UK Office for National Statistics (ONS)(3) and admissions data from England's Hospital Episode Statistics (HES) Admitted Patient Care (APC)(4) or Wales' Patient Episode Database for Wales (PEDW)(5). The data linkage was performed by NHS Digital (application reference: DARS-NIC-349273-T3L4K-v3.7) and NHS Wales Informatics Service (NWIS) (application reference: 29892); national opt-outs were upheld. Pseudonymised linked data were sent via secure file transfer to Imperial College London for analysis. After data cleaning to remove patients under the age of 35 years and admissions with an impossible chronology, the dataset was limited to the first admission for each patient in the audit period. This left a dataset of 30,294 patients. This dataset was used to conduct our analysis; further details can be found in the audit outcomes report(6).

Variables

The primary exposure in this study was conforming to the COPD Best Practice Tariff (BPT). An admission was considered to have conformed to the BPT if a patient received a respiratory specialist review ≤24 hours after admission ***and*** a COPD discharge bundle at or before discharge. The nature of that discharge bundle was left to individual hospitals. Admissions where the patient was not reviewed by a respiratory specialist were included in the same category as admissions that received a respiratory specialist review >24 hours after admission. Admissions where 'not clear' was the chosen response to 'Has a BTS, or equivalent, discharge bundle been completed for this admission?' were considered to have not received a discharge bundle. The two components of the COPD BPT (specialist review within 24 hours and discharge bundle) were also considered separately as individual exposures in secondary analyses.

Patients who died during their admission or self-discharged were excluded from analyses as these patients are unlikely to have been able to receive a discharge bundle and it would be unfair to include these admissions in our assessment of conformation to the COPD BPT. Patients with 'other' as the response to whether they received a discharge bundle or not were also excluded from analysis.

The outcomes of admissions that were examined in this study were 30-day mortality and 30-day readmissions. The patient was considered to have died within 30 days of admission if there was an ONS death record <30 days after their admission date (as inpatient deaths were excluded this means that our definition of 30-day mortality represents a variable period after discharge dependent on the length of stay). The data received by us only contained 30-day mortality in a binary format (yes/no

patient died within 30 days of admission) therefore we are unable to calculate 30-day post-discharge mortality. The patient was considered to have been readmitted within 30 days of discharge if there was a HES APC or PEDW admission record for any type of emergency hospital admission <30 days after discharge.

Potential confounders used in the analysis were age, sex, socioeconomic status (SES), oxygen needed during admission, non-invasive ventilation (NIV) administered during admission, length of stay, smoking status, Charlson comorbidity index (CCI), and a history of mental illness. Respiratory specialist review was included as an additional confounder in analyses of the COPD discharge bundle as we hypothesised that individuals that had received a specialist review were more likely to receive a discharge bundle. SES was defined using quintile of English Index of Multiple Deprivation (IMD) or Welsh Index of Multiple Deprivation (WIMD). IMD and WIMD are measures of relative deprivation between small areas of England and Wales, respectively(7,8). Quintile of IMD/WIMD was calculated for each patient based on their home postcode. Length of stay was split into quintile of number of days between admission and discharge. Smoking status was coded as current, ex, never, or not recorded. CCI was calculated using ICD-10 codes as defined by Quan et al.(9,10). All patients were assumed to have a CCI of at least 1 as they were admitted for AECOPD. Age was excluded from the CCI as it was used individually as a covariate. Mental health diagnoses were categorised as no mental illness, mild/moderate mental illness, or severe mental illness. Mild/moderate mental illness was classified as a secondary diagnosis of either depression or anxiety (see **Supplementary Table S1** for ICD-10 codes) during the admission. Severe mental illness was classified as a secondary diagnosis of any schizophrenia, bipolar or other psychotic disorders (see **Supplementary Table S2** for ICD-10 codes) during the admission

Statistical analysis

All data management and statistical analyses were performed using Stata 15 (StataCorp, College Station, TX, USA). Data were first summarised using means and proportions where appropriate. In our primary analysis to investigate association between an admission conforming to the COPD BPT (receiving specialist review within 24 hours ***and*** receiving a discharge bundle) and 30-day (from admission) mortality and 30-day (from discharge) readmission we used mixed-effects logistic regression (xtlogit command, 're' option) with a random intercept for hospital to account for clustering of patients within hospitals. Odds ratios with 95% confidence intervals were generated for each outcome. After univariate analysis, regression models were adjusted by including the potential confounders described above as covariates in the model.

Secondary analyses were performed using specialist review within 24 hours and receipt of a discharge bundle as the independent variables in place of conformation to the BPT to test the individual components of the BPT. Additionally, we further tested the components of the specialist review within 24 hours variable: patients that either did or did not have a specialist review, and for patients that did have a review, those who had one in ≤24 hours and those that had one in >24 hours.

Missing data were minimal for variables included in regression models and where data were missing, complete case analysis was used. Odds ratio graphs were generated using coefplot(11).

Sensitivity analyses

We repeated the discharge bundle analysis excluding 'not clear' responses to the 'Has a BTS, or equivalent, discharge bundle been completed for this admission?' question to determine if there was a strengthening of the effect of a discharge bundle on the outcomes if it was known for certain whether a patient received a bundle or not. We also repeated the specialist review analyses using

the full audit cohort (including patients that died as an inpatient or self-discharged) to determine if specialist review was associated with mortality in the full 30-day period from admission or inpatient mortality. Additionally, we repeated the analysis using 90-day mortality and 90-day readmissions as the outcomes. This was to examine if the benefits of the COPD BPT were not detectable until sufficient time had passed for all elements of the discharge bundle to be completed (such as smoking cessation and pulmonary rehabilitation). We also ran the analysis without Welsh hospitals, as these are not eligible to participate in the BPT, to see if there was any change in patient outcomes. Finally, we examined if there was any difference in patient outcomes between hospitals that met the 60% target for BPT conforming admissions and hospitals that did not meet the target.

Ethical approval

The audit operates under Section 251 approval from the Confidentiality Advisory Group (CAG) of the Health Research Authority (HRA). The reference number is CAG-8-06(b)/2013. This approval also grants the Royal College of Physicians permission to link audit data to externally held sources of data (using patient identifiable data items) for derivation of longer-term outcomes of the patient cohort. A record of the approval can be found at: https://www.hra.nhs.uk/about-the-hra/our-committees/section-251/cag-advice-and-approval-decisions (April 2013 onwards; non research). The data sharing agreement with NHS digital (DARS-NIC-349273-T3L4K-v3.7) also permits publication of aggregated patient data in peer-reviewed journals. Additional approval for this specific project was sought from HQIP following NACAP processes through an Extended Scope Output form.

Supplementary Results

The COPD BPT individual components

Respiratory specialist review

53% of admissions were reviewed by a respiratory specialist within 24 hours (**Supplementary Table S4**). Patients that received a respiratory specialist review within 24 hours, compared with patients who did not receive a respiratory specialist review or received a review in >24 hours, were slightly younger (71.3 vs 73.0 years), had more prescribed oxygen (59.5% vs. 49.6%), more NIV administered (11.7% vs. 6.0%), more smoking status recorded (93.9% vs 87.0%), more likely to have DECAF score recorded (19.7% vs. 7.3%), and more spirometry results available (43.5% vs. 31.3%) (**Supplementary Table S4**).

24% of patients did not receive a respiratory specialist review at all (**Supplementary Table S5**). Of the 76% of patients who did receive a review, 69% were within 24 hours of admission, meaning that 31% of reviewed patients had to wait more than 24 hours for a review (**Supplementary Table S6**). Patients who received a respiratory specialist review, compared with patients who did not receive a specialist review at all, had more prescribed oxygen (59.7% vs. 39.2%), more NIV administered (11.3% vs.1.7%), fewer hospital stays of 0-1 days (19.5% vs. 48.4%), more hospital stays of 9 or more days (20.9% vs. 10.4%), more smoking status recorded (93.5% vs. 81.4%), more DECAF score recorded (17.7% vs. 1.5%), and more spirometry results recorded (41.7% vs. 24.9%) (**Supplementary Table S5**). Patients who received a respiratory specialist review within 24 hours of admission, compared with patients who received a specialist review in >24 hours of admission, had more hospital stays of 0-1 days (25.9% vs. 5.2%) and fewer hospital stays of 9 or more days (17.6% vs. 28.2%) (**Supplementary Table S6**).

In mixed-effects logistic regression analysis, we found no significant difference in 30-day mortality or 30-day readmission between admissions that were reviewed by a respiratory specialist within 24 hours and those that were not reviewed or reviewed in >24 hours (**Figure 2a**/**Supplementary Table S7**). We also did not find a significant difference in 30-day mortality or 30-day readmission between patients who did and did not receive a specialist review (**Figure 2b**/**Supplementary Table S8**) and neither did we find a significant difference in either outcome between patients who received a review within 24 hours and those who received a review in >24 hours (**Figure 2c**/**Supplementary Table S9**).

COPD discharge care bundle

54% of admissions received a discharge bundle (**Supplementary Table S10**). Patients who received a discharge bundle, compared with patients who did not receive a discharge bundle, had more prescribed oxygen (60.1% vs. 48.8%), more NIV administered (10.5% vs. 7.3%), fewer hospital stays of 0-1 days (20.2% vs. 33.5%), more hospital stays of 9 or more days (20.6% vs. 15.8%), more smoking status recorded (95.2% vs. 85.4%), more DECAF score recorded (24.1% vs. 1.9%), and more spirometry results available (44.1% vs. 30.4%) (**Supplementary Table S10**).

In mixed-effects logistic regression analysis, no significant difference in 30-day mortality or 30-day readmission was observed between admissions that received a discharge bundle and those that did not receive a discharge bundle (**Figure 2d**/**Supplementary Table S11**).

Supplementary References

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Supplementary Tables

Supplementary Table S1. Mild/moderate mental illness (depression or anxiety) ICD-10 codes. All sub-codes were included for each code.

ICD-10 Code	Description
F32	Depressive episode
F33	Recurrent depressive disorder
F34	Persistent mood [affective] disorders
F38	Other mood [affective] disorders
F39	Unspecified mood [affective] disorder
F40	Phobic anxiety disorders
F41	Other anxiety disorders

Supplementary Table S2. Severe mental illness (schizophrenia, bipolar or other psychotic disorder) ICD-10 codes. All sub-codes were included for each code.

ICD-10 Code	Description
F06	Other mental disorders due to brain damage and dysfunction and to physical disease
F10	Mental and behavioural disorders due to use of alcohol
F11	Mental and behavioural disorders due to use of opioids
F12	Mental and behavioural disorders due to use of cannabinoids
F13	Mental and behavioural disorders due to use of sedatives or hypnotics
F14	Mental and behavioural disorders due to use of cocaine
F15	Mental and behavioural disorders due to use of other stimulants, including caffeine
F16	Mental and behavioural disorders due to use of hallucinogens
F18	Mental and behavioural disorders due to use of volatile solvents
F19	Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances
F20	Schizophrenia
F23	Acute and transient psychotic disorders
F24	Induced delusional disorder
F25	Schizoaffective disorders
F28	Other nonorganic psychotic disorders
F30	Manic episode
F31	Bipolar affective disorder
F60	Specific personality disorders

Supplementary Table S3. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD whose admissions conformed to the COPD Best Practice Tariff (BPT) relative to those whose admissions did not conform to the COPD BPT.

COPD BPT admission outcomes	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	1.00 (0.85 – 1.18)	1.09 (0.92 – 1.29)
Death within 90 days of admission	1.02 (0.92 – 1.12)	1.10 (0.99 – 1.22)
Readmission within 30 days of discharge	0.96 (0.90 – 1.02)	0.96 (0.90 – 1.02)
Readmission within 90 days of discharge	1.01 (0.96 – 1.07)	1.04 (0.98 – 1.10)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: BPT: Best Practice Tariff; CI: confidence interval; COPD: chronic obstructive pulmonary disease.

Supplementary Table S4. Demographics of and outcomes for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review within 24 hours of admission and those who did not receive a review or received a review in more than 24 hours after admission. N=28,345

	Patient reviewed within 24 hours of admission *N = 14,991*		Patient not reviewed or reviewed in >24 hours *N = 13,354*	
	n	(%)	n	(%)
Age (years)				
Mean (SD)	71.3	(10.5)	73.0	(11.0)
Gender				
Male	6,939	(46.3%)	6,299	(47.2%)
Female	8,052	(53.7%)	7,055	(52.8%)
Quintile of IMD/WIMD				
1 (most deprived)	5,049	(33.7%)	4,204	(31.5%)
2	3,573	(23.8%)	3,190	(23.9%)
3	2,688	(17.9%)	2,543	(19.0%)
4	2,074	(13.8%)	1,928	(14.4%)
5 (least deprived)	1,473	(9.8%)	1,363	(10.2%)
No data	134	(0.9%)	126	(0.9%)
Oxygen prescription				
Not needed	2,642	(17.6%)	2,710	(20.3%)
Not prescribed	3,424	(22.8%)	4,015	(30.1%)
Prescribed	8,925	(59.5%)	6,629	(49.6%)
NIV administered	1,754	(11.7%)	801	(6.0%)
Length of stay quintile				
0-1 days	3,877	(25.9%)	3,579	(26.8%)
2-3 days	3,699	(24.7%)	3,172	(23.8%)
4-5 days	2,475	(16.5%)	2,173	(16.3%)
6-8 days	2,301	(15.4%)	1,855	(13.9%)
9+ days	2,639	(17.6%)	2,575	(19.3%)
Smoking status				
Never smoked	430	(2.9%)	558	(4.2%)
Ex-smoker	8,596	(57.3%)	7,199	(53.9%)
Current smoker	5,058	(33.7%)	3,863	(28.9%)
Not recorded	907	(6.1%)	1,734	(13.0%)
Charlson Comorbidity Index				
1	7,630	(50.9%)	6,005	(45.0%)
2	3,677	(24.5%)	3,431	(25.7%)
3	1,936	(12.9%)	1,904	(14.3%)
4	929	(6.2%)	1,000	(7.5%)
5	462	(3.1%)	521	(3.9%)
6	159	(1.1%)	221	(1.7%)
7+	198	(1.3%)	272	(2.0%)
Mental health diagnoses				
No mental illness	11,859	(79.1%)	10,797	(80.9%)
Mild/moderate mental illness	2,176	(14.5%)	1,737	(13.0%)
Severe mental illness	956	(6.4%)	820	(6.1%)
DECAF score				
Low risk (0-1)	1,729	(11.5%)	489	(3.7%)
Intermediate risk (2)	733	(4.9%)	274	(2.1%)
High risk (3-6)	494	(3.3%)	211	(1.6%)
No data	12,035	(80.3%)	12,380	(92.7%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	751	(5.0%)	622	(4.7%)
< 0.7	5,666	(37.8%)	3,471	(26.0%)
Invalid (< 0.2 or > 1.0)	111	(0.7%)	87	(0.7%)
No data	8,463	(56.5%)	9,174	(68.7%)
Outcomes				
Patient died within 30 days of admission	401	(2.7%)	345	(2.6%)
Patient readmitted within 30 days of discharge	3,763	(25.1%)	3,473	(26.0%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S5. Demographics of and outcomes for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review at any time during admission and those who did not receive a review at any point during admission. N=28,345

	Patient received a respiratory specialist review ***N = 21,666***		**Patient did not receive a respiratory specialist review** ***N = 6,679***	
	n	**(%)**	**n**	**(%)**
Age (years)				
Mean (SD)	71.8	(10.5)	73.2	(11.3)
Gender				
Male	9,962	(46.0%)	3,276	(49.1%)
Female	11,704	(54.0%)	3,403	(51.0%)
Quintile of IMD/WIMD				
1 (most deprived)	7,087	(32.7%)	2,166	(32.4%)
2	5,187	(23.9%)	1,576	(23.6%)
3	3,979	(18.4%)	1,252	(18.8%)
4	3,033	(14.0%)	969	(14.5%)
5 (least deprived)	2,182	(10.1%)	654	(9.8%)
No data	198	(0.9%)	62	(0.9%)
Oxygen prescription				
Not needed	3,664	(16.9%)	1,688	(25.3%)
Not prescribed	5,069	(23.4%)	2,370	(35.5%)
Prescribed	12,933	(59.7%)	2,621	(39.2%)
NIV administered	2,443	(11.3%)	112	(1.7%)
Length of stay quintile				
0-1 days	4,225	(19.5%)	3,231	(48.4%)
2-3 days	5,359	(24.7%)	1,512	(22.6%)
4-5 days	3,961	(18.3%)	687	(10.3%)
6-8 days	3,601	(16.6%)	555	(8.3%)
9+ days	4,520	(20.9%)	694	(10.4%)
Smoking status				
Never smoked	643	(3.0%)	345	(5.2%)
Ex-smoker	12,540	(57.9%)	3,255	(48.7%)
Current smoker	7,084	(32.7%)	1,837	(27.5%)
Not recorded	1,399	(6.5%)	1,242	(18.6%)
Charlson Comorbidity Index				
1	10,660	(49.2%)	2,975	(44.5%)
2	5,431	(25.1%)	1,677	(25.1%)
3	2,894	(13.4%)	946	(14.2%)
4	1,382	(6.4%)	547	(8.2%)
5	707	(3.3%)	276	(4.1%)
6	272	(1.3%)	108	(1.6%)
7+	320	(1.5%)	150	(2.3%)
Mental health diagnoses				
No mental illness	17,185	(79.3%)	5,471	(81.9%)
Mild/moderate mental illness	3,100	(14.3%)	813	(12.2%)
Severe mental illness	1,381	(6.4%)	395	(5.9%)
DECAF score				
Low risk (0-1)	2,167	(10.0%)	51	(0.8%)
Intermediate risk (2)	980	(4.5%)	27	(0.4%)
High risk (3-6)	683	(3.2%)	22	(0.3%)
No data	17,836	(82.3%)	6,579	(98.5%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	1,093	(5.0%)	280	(4.2%)
< 0.7	7,787	(35.9%)	1,350	(20.2%)
Invalid (< 0.2 or > 1.0)	166	(0.8%)	32	(0.5%)
No data	12,620	(58.3%)	5,017	(75.1%)
Outcomes				
Patient died within 30 days of admission	583	(2.7%)	163	(2.4%)
Patient readmitted within 30 days of discharge	5,609	(25.9%)	1,627	(24.4%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S6. Demographics of and outcomes for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review within 24 hours of admission and those who received a respiratory specialist >24 hours after admission. N=21,666

	Patient reviewed in ≤24 hours of admission *N = 14,991*		Patient reviewed in >24 hours of admission *N = 6,675*	
	n	(%)	n	(%)
Age (years)				
Mean (SD)	71.3	(10.5)	72.8	(10.6)
Gender				
Male	6,939	(46.3%)	3,023	(45.3%)
Female	8,052	(53.7%)	3,652	(54.7%)
Quintile of IMD/WIMD				
1 (most deprived)	5,049	(33.7%)	2,038	(30.8%)
2	3,573	(23.8%)	1,614	(24.4%)
3	2,688	(17.9%)	1,291	(19.5%)
4	2,074	(13.8%)	959	(14.5%)
5 (least deprived)	1,473	(9.8%)	709	(10.7%)
No data	134	(0.9%)	64	(1.0%)
Oxygen prescription				
Not needed	2,642	(17.6%)	1,022	(15.3%)
Not prescribed	3,424	(22.8%)	1,645	(24.6%)
Prescribed	8,925	(59.5%)	4,008	(60.0%)
NIV administered	1,754	(11.7%)	689	(10.3%)
Length of stay quintile				
0-1 days	3,877	(25.9%)	348	(5.2%)
2-3 days	3,699	(24.7%)	1,660	(24.9%)
4-5 days	2,475	(16.5%)	1,486	(22.3%)
6-8 days	2,301	(15.4%)	1,300	(19.5%)
9+ days	2,639	(17.6%)	1,881	(28.2%)
Smoking status				
Never smoked	430	(2.9%)	213	(3.2%)
Ex-smoker	8,596	(57.3%)	3,944	(59.1%)
Current smoker	5,058	(33.7%)	2,026	(30.4%)
Not recorded	907	(6.1%)	492	(7.4%)
Charlson Comorbidity Index				
1	7,630	(50.9%)	3,030	(45.4%)
2	3,677	(24.5%)	1,754	(26.3%)
3	1,936	(12.9%)	958	(14.4%)
4	929	(6.2%)	453	(6.8%)
5	462	(3.1%)	245	(3.7%)
6	159	(1.1%)	113	(1.7%)
7+	198	(1.3%)	122	(1.8%)
Mental health diagnoses				
No mental illness	11,859	(79.1%)	5,326	(79.8%)
Mild/moderate mental illness	2,176	(14.5%)	924	(13.8%)
Severe mental illness	956	(6.4%)	425	(6.4%)
DECAF score				
Low risk (0-1)	1,729	(11.5%)	438	(6.6%)
Intermediate risk (2)	733	(4.9%)	247	(3.7%)
High risk (3-6)	494	(3.3%)	189	(2.8%)
No data	12,035	(80.3%)	5,801	(86.9%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	751	(5.0%)	342	(5.1%)
< 0.7	5,666	(37.8%)	2,121	(31.8%)
Invalid (< 0.2 or > 1.0)	111	(0.7%)	55	(0.8%)
No data	8,463	(56.5%)	4,157	(62.3%)
Outcomes				
Patient died within 30 days of admission	401	(2.7%)	182	(2.7%)
Patient readmitted within 30 days of discharge	3,763	(25.1%)	1,846	(27.7%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S7. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review within 24 hours of their admission relative to those who did not receive a review or received a review in >24 hours of admission.

Review in 24 hours outcomes	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	1.02 (0.87 – 1.19)	1.13 (0.96 – 1.33)
Death within 90 days of admission	1.05 (0.95 – 1.15)	**1.16 (1.05 – 1.28)**
Readmission within 30 days of discharge	**0.94 (0.89 – 1.00)**	0.95 (0.90 – 1.01)
Readmission within 90 days of discharge	0.99 (0.94 – 1.04)	1.02 (0.97 – 1.08)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: AECOPD: acute exacerbation of chronic obstructive pulmonary disease; CI: confidence interval.

Supplementary Table S8. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review at any time during their admission relative to those who did not receive a review at any point during admission.

Received specialist review outcomes	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	1.11 (0.92 – 1.33)	1.09 (0.89 – 1.33)
Death within 90 days of admission	**1.30 (1.16 – 1.46)**	**1.20 (1.06 – 1.36)**
Readmission within 30 days of discharge	**1.10 (1.03 – 1.17)**	0.99 (0.92 – 1.06)
Readmission within 90 days of discharge	**1.10 (1.04 – 1.17)**	1.04 (0.98 – 1.11)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: AECOPD: acute exacerbation of chronic obstructive pulmonary disease; CI: confidence interval.

Supplementary Table S9. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD who received a respiratory specialist review within 24 hours of their admission relative to those who received a respiratory specialist review in >24 hours.

Time to specialist review outcomes	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	0.96 (0.80 – 1.15)	1.14 (0.95 – 1.39)
Death within 90 days of admission	0.91 (0.82 – 1.01)	**1.13 (1.01 – 1.26)**
Readmission within 30 days of discharge	**0.87 (0.82 – 0.93)**	0.95 (0.88 – 1.02)
Readmission within 90 days of discharge	**0.93 (0.88 – 0.99)**	1.00 (0.94 – 1.07)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: AECOPD: acute exacerbation of chronic obstructive pulmonary disease; CI: confidence interval.

Supplementary Table 10. Demographics of and outcomes for people discharged from hospital following acute exacerbation of COPD who received a discharge bundle and those that did not receive a discharge bundle. N=28,345

	Patient received a discharge bundle at or before discharge *N = 15,261*		Patient did not receive a discharge bundle *N = 13,084*	
	n	(%)	n	(%)
Age (years)				
Mean (SD)	71.9	(10.3)	72.4	(11.2)
Gender				
Male	7,049	(46.2%)	6,189	(47.3%)
Female	8,212	(53.8%)	6,895	(52.7%)
Quintile of IMD/WIMD				
1 (most deprived)	4,946	(32.4%)	4,307	(32.9%)
2	3,637	(23.8%)	3,126	(23.9%)
3	2,755	(18.1%)	2,476	(18.9%)
4	2,208	(14.5%)	1,794	(13.7%)
5 (least deprived)	1,579	(10.4%)	1,257	(9.6%)
No data	136	(0.9%)	124	(1.0%)
Oxygen prescription				
Not needed	2,557	(16.8%)	2,795	(21.4%)
Not prescribed	3,540	(23.2%)	3,899	(29.8%)
Prescribed	9,164	(60.1%)	6,390	(48.8%)
NIV administered	1,598	(10.5%)	957	(7.3%)
Length of stay quintile				
0-1 days	3,078	(20.2%)	4,378	(33.5%)
2-3 days	3,756	(24.6%)	3,115	(23.8%)
4-5 days	2,761	(18.1%)	1,887	(14.4%)
6-8 days	2,520	(16.5%)	1,636	(12.5%)
9+ days	3,146	(20.6%)	2,068	(15.8%)
Smoking status				
Never smoked	396	(2.6%)	592	(4.5%)
Ex-smoker	9,079	(59.5%)	6,716	(51.3%)
Current smoker	5,061	(33.2%)	3,860	(29.5%)
Not recorded	725	(4.8%)	1,916	(14.6%)
Charlson Comorbidity Index				
1	7,472	(49.0%)	6,163	(47.1%)
2	3,843	(25.2%)	3,265	(25.0%)
3	2,061	(13.5%)	1,779	(13.6%)
4	1,005	(6.6%)	924	(7.1%)
5	479	(3.1%)	504	(3.9%)
6	188	(1.2%)	192	(1.5%)
7+	213	(1.4%)	257	(2.0%)
Mental health diagnoses				
No mental illness	12,079	(79.2%)	10,577	(80.8%)
Mild/moderate mental illness	2,216	(14.5%)	1,697	(13.0%)
Severe mental illness	966	(6.3%)	810	(6.2%)
DECAF score				
Low risk (0-1)	2,090	(13.7%)	128	(1.0%)
Intermediate risk (2)	932	(6.1%)	75	(0.6%)
High risk (3-6)	660	(4.3%)	45	(0.3%)
No data	11,579	(75.9%)	12,836	(98.1%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	742	(4.9%)	631	(4.8%)
< 0.7	5,854	(38.4%)	3,283	(25.1%)
Invalid (< 0.2 or > 1.0)	130	(0.9%)	68	(0.5%)
No data	8,535	(55.9%)	9,102	(69.6%)
Outcomes				
Patient died within 30 days of admission	398	(2.6%)	348	(2.7%)
Patient readmitted within 30 days of discharge	3,936	(25.8%)	3,300	(25.2%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S11. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD who received a discharge bundle relative to those who did not receive a discharge bundle.

Discharge bundle outcomes	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	0.93 (0.78 – 1.09)	0.92 (0.76 – 1.11)
Death within 90 days of admission	1.03 (0.93 – 1.13)	0.95 (0.84 – 1.06)
Readmission within 30 days of discharge	1.02 (0.96 – 1.09)	0.98 (0.91 – 1.05)
Readmission within 90 days of discharge	**1.07 (1.01 – 1.12)**	1.04 (0.97 – 1.11)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, mental health diagnoses, and respiratory specialist review.
Notes: Statistically significant results in bold.
Abbreviations: AECOPD: acute exacerbation of chronic obstructive pulmonary disease; CI: confidence interval.

Supplementary Table S12. Demographics of and outcomes for people admitted to hospital with acute exacerbation of COPD (i.e., the full audit cohort **including patients who died as an inpatient or self-discharged**) who received a respiratory specialist review within 24 hours of admission and those who did not receive a review or received a review in more than 24 hours after admission. N=30,294

	Patient reviewed within 24 hours of admission *N = 15,956*		Patient not reviewed or reviewed in >24 hours *N = 14,338*	
	n	(%)	n	(%)
Age (years)				
Mean (SD)	71.5	(10.5)	73.1	(11.0)
Gender				
Male	7,401	(46.4%)	6,789	(47.4%)
Female	8,555	(53.6%)	7,549	(52.7%)
Quintile of IMD/WIMD				
1 (most deprived)	5,348	(33.5%)	4,482	(31.3%)
2	3,750	(23.5%)	3,385	(23.6%)
3	2,893	(18.1%)	2,759	(19.2%)
4	2,221	(13.9%)	2,082	(14.5%)
5 (least deprived)	1,598	(10.0%)	1,493	(10.4%)
No data	146	(0.9%)	137	(1.0%)
Oxygen prescription				
Not needed	2,757	(17.3%)	2,864	(20.0%)
Not prescribed	3,588	(22.5%)	4,261	(29.7%)
Prescribed	9,611	(60.2%)	7,213	(50.3%)
NIV administered	2,028	(12.7%)	1,017	(7.1%)
Length of stay quintile				
0-1 days	4,083	(25.6%)	3,798	(26.5%)
2-3 days	3,924	(24.6%)	3,342	(23.3%)
4-5 days	2,591	(16.2%)	2,319	(16.2%)
6-8 days	2,447	(15.3%)	1,980	(13.8%)
9+ days	2,911	(18.2%)	2,899	(20.2%)
Smoking status				
Never smoked	468	(2.9%)	615	(4.3%)
Ex-smoker	9,155	(57.4%)	7,673	(53.5%)
Current smoker	5,327	(33.4%)	4,136	(28.9%)
Not recorded	1,006	(6.3%)	1,914	(13.4%)
Charlson Comorbidity Index				
1	8,039	(50.4%)	6,344	(44.3%)
2	3,915	(24.5%)	3,698	(25.8%)
3	2,076	(13.0%)	2,064	(14.4%)
4	1,012	(6.3%)	1,101	(7.7%)
5	506	(3.2%)	572	(4.0%)
6	178	(1.1%)	242	(1.7%)
7+	230	(1.4%)	317	(2.2%)
Mental health diagnoses				
No mental illness	12,614	(79.1%)	11,597	(80.9%)
Mild/moderate mental illness	2,328	(14.6%)	1,851	(12.9%)
Severe mental illness	1,014	(6.4%)	890	(6.2%)
DECAF score				
Low risk (0-1)	1,763	(11.1%)	505	(3.5%)
Intermediate risk (2)	764	(4.8%)	286	(2.0%)
High risk (3-6)	540	(3.4%)	237	(1.7%)
No data	12,889	(80.8%)	13,310	(92.8%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	797	(5.0%)	659	(4.6%)
< 0.7	6,002	(37.6%)	3,714	(25.9%)
Invalid (< 0.2 or > 1.0)	122	(0.8%)	93	(0.7%)
No data	9,035	(56.6%)	9,872	(68.9%)
Outcomes				
Patient died within 30 days of admission	923	(5.8%)	909	(6.3%)
Patient died as an inpatient	585	(3.7%)	628	(4.4%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S13. Demographics of and outcomes for people admitted to hospital with acute exacerbation of COPD (i.e., the full audit cohort **including patients who died as an inpatient or self-discharged**) who received a respiratory specialist review at any time during admission and those who did not receive a review at any point during admission. N=30,294

	Patient received a respiratory specialist review ***N = 23,113***		**Patient did not receive a respiratory specialist review** ***N = 7,181***	
	n	**(%)**	**n**	**(%)**
Age (years)				
Mean (SD)	71.9	(10.5)	73.3	(11.4)
Gender				
Male	10,663	(46.1%)	3,527	(49.1%)
Female	12,450	(53.9%)	3,654	(50.9%)
Quintile of IMD/WIMD				
1 (most deprived)	7,516	(32.5%)	2,314	(32.2%)
2	5,458	(23.6%)	1,677	(23.4%)
3	4,297	(18.6%)	1,355	(18.9%)
4	3,252	(14.1%)	1,051	(14.6%)
5 (least deprived)	2,375	(10.3%)	716	(10.0%)
No data	215	(0.9%)	68	(1.0%)
Oxygen prescription				
Not needed	3,832	(16.6%)	1,789	(24.9%)
Not prescribed	5,330	(23.1%)	2,519	(35.1%)
Prescribed	13,951	(60.4%)	2,873	(40.0%)
NIV administered	2,846	(12.3%)	199	(2.8%)
Length of stay quintile				
0-1 days	4,440	(19.2%)	3,441	(47.9%)
2-3 days	5,648	(24.4%)	1,618	(22.5%)
4-5 days	4,168	(18.0%)	742	(10.3%)
6-8 days	3,835	(16.6%)	592	(8.2%)
9+ days	5,022	(21.7%)	788	(11.0%)
Smoking status				
Never smoked	707	(3.1%)	376	(5.2%)
Ex-smoker	13,361	(57.8%)	3,467	(48.3%)
Current smoker	7,489	(32.4%)	1,974	(27.5%)
Not recorded	1,556	(6.7%)	1,364	(19.0%)
Charlson Comorbidity Index				
1	11,219	(48.5%)	3,164	(44.1%)
2	5,807	(25.1%)	1,806	(25.2%)
3	3,108	(13.5%)	1,032	(14.4%)
4	1,525	(6.6%)	588	(8.2%)
5	777	(3.4%)	301	(4.2%)
6	301	(1.3%)	119	(1.7%)
7+	376	(1.6%)	171	(2.4%)
Mental health diagnoses				
No mental illness	18,331	(79.3%)	5,880	(81.9%)
Mild/moderate mental illness	3,315	(14.3%)	864	(12.0%)
Severe mental illness	1,467	(6.4%)	437	(6.1%)
DECAF score				
Low risk (0-1)	2,216	(9.6%)	52	(0.7%)
Intermediate risk (2)	1,022	(4.4%)	28	(0.4%)
High risk (3-6)	751	(3.3%)	26	(0.4%)
No data	19,124	(82.7%)	7,075	(98.5%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	1,154	(5.0%)	302	(4.2%)
< 0.7	8,245	(35.7%)	1,471	(20.5%)
Invalid (< 0.2 or > 1.0)	182	(0.8%)	33	(0.5%)
No data	13,532	(58.6%)	5,375	(74.9%)
Outcomes				
Patient died within 30 days of admission	1,390	(6.0%)	442	(6.2%)
Patient died as an inpatient	908	(3.9%)	305	(4.3%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S14. Demographics of and outcomes for people admitted to hospital with acute exacerbation of COPD (i.e., the full audit cohort **including patients who died as an inpatient or self-discharged**) who received a respiratory specialist review within 24 hours of admission and those who received a respiratory specialist >24 hours after admission. N=23,113

	Patient reviewed in ≤24 hours of admission *N = 15,956*		Patient reviewed in >24 hours of admission *N = 7,157*	
	n	(%)	n	(%)
Age (years)				
Mean (SD)	71.5	(10.5)	72.9	(10.6)
Gender				
Male	7,401	(46.4%)	3,262	(45.6%)
Female	8,555	(53.6%)	3,895	(54.4%)
Quintile of IMD/WIMD				
1 (most deprived)	5,348	(33.5%)	2,168	(30.3%)
2	3,750	(23.5%)	1,708	(23.9%)
3	2,893	(18.1%)	1,404	(19.6%)
4	2,221	(13.9%)	1,031	(14.4%)
5 (least deprived)	1,598	(10.0%)	777	(10.9%)
No data	146	(0.9%)	69	(1.0%)
Oxygen prescription				
Not needed	2,757	(17.3%)	1,075	(15.0%)
Not prescribed	3,588	(22.5%)	1,742	(24.3%)
Prescribed	9,611	(60.2%)	4,340	(60.6%)
NIV administered	2,028	(12.7%)	818	(11.4%)
Length of stay quintile				
0-1 days	4,083	(25.6%)	357	(5.0%)
2-3 days	3,924	(24.6%)	1,724	(24.1%)
4-5 days	2,591	(16.2%)	1,577	(22.0%)
6-8 days	2,447	(15.3%)	1,388	(19.4%)
9+ days	2,911	(18.2%)	2,111	(29.5%)
Smoking status				
Never smoked	468	(2.9%)	239	(3.3%)
Ex-smoker	9,155	(57.4%)	4,206	(58.8%)
Current smoker	5,327	(33.4%)	2,162	(30.2%)
Not recorded	1,006	(6.3%)	550	(7.7%)
Charlson Comorbidity Index				
1	8,039	(50.4%)	3,180	(44.4%)
2	3,915	(24.5%)	1,892	(26.4%)
3	2,076	(13.0%)	1,032	(14.4%)
4	1,012	(6.3%)	513	(7.2%)
5	506	(3.2%)	271	(3.8%)
6	178	(1.1%)	123	(1.7%)
7+	230	(1.4%)	146	(2.0%)
Mental health diagnoses				
No mental illness	12,614	(79.1%)	5,717	(79.9%)
Mild/moderate mental illness	2,328	(14.6%)	987	(13.8%)
Severe mental illness	1,014	(6.4%)	453	(6.3%)
DECAF score				
Low risk (0-1)	1,763	(11.1%)	453	(6.3%)
Intermediate risk (2)	764	(4.8%)	258	(3.6%)
High risk (3-6)	540	(3.4%)	211	(3.0%)
No data	12,889	(80.8%)	6,235	(87.1%)
Spirometry: FEV_1/FVC ratio				
≥ 0.7	797	(5.0%)	357	(5.0%)
< 0.7	6,002	(37.6%)	2,243	(37.6%)
Invalid (< 0.2 or > 1.0)	122	(0.8%)	60	(0.8%)
No data	9,035	(56.6%)	4,497	(62.8%)
Outcomes				
Died within 30 days of admission	923	(5.8%)	467	(6.5%)
Died as an inpatient	585	(3.7%)	323	(4.5%)

Abbreviations: DECAF: Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation; FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; IMD: English Index of Multiple Deprivation; NIV: non-invasive ventilation; SD: standard deviation; WIMD: Welsh Index of Multiple Deprivation.

Supplementary Table S15. Odds ratios and 95% confidence intervals for **30-day mortality** and **inpatient mortality** for each respiratory specialist review exposure **in the full audit cohort** of acute exacerbation of COPD admissions (**including patients who died as an inpatient or self-discharged**).

Exposure (intervention/control) / Outcome	**Odds ratio (95% CI)**		**Adjusted* odds ratio (95% CI)**	
Specialist review in 24 hours (yes/no)				
Death within 30 days of admission	0.94	(0.85 – 1.04)	0.93	(0.83 – 1.03)
Death while an inpatient	0.90	(0.80 – 1.02)	**0.82**	**(0.72 – 0.93)**
Received specialist review (yes/no)				
Death within 30 days of admission	1.01	(0.90 – 1.14)	**0.82**	**(0.72 – 0.94)**
Death while an inpatient	0.99	(0.86 – 1.14)	**0.69**	**(0.58 – 0.81)**
Time to specialist review (≤24hrs/>24hrs)				
Death within 30 days of admission	0.91	(0.81 – 1.03)	1.03	(0.90 – 1.17)
Death while an inpatient	0.88	(0.76 – 1.02)	0.96	(0.82 – 1.12)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: CI: confidence interval.

Supplementary Table S16. Odds ratios and 95% confidence intervals for mortality and readmission for all COPD Best Practice Tariff (BPT) criteria (combined and separately) in people discharged from hospital following acute exacerbation of COPD who were admitted to **English hospitals only**.

COPD BPT Criteria (intervention/control) / English Hospitals Outcome	**Odds ratio (95% CI)**		**Adjusted* odds ratio (95% CI)**	
BPT conforming admission (yes/no)				
Death within 30 days of admission	0.95	(0.81 – 1.12)	1.04	(0.88 – 1.23)
Death within 90 days of admission	0.97	(0.88 – 1.07)	1.04	(0.94 – 1.15)
Readmission within 30 days of discharge	0.95	(0.90 – 1.01)	0.96	(0.90 – 1.02)
Readmission within 90 days of discharge	1.00	(0.95 – 1.06)	1.03	(0.97 – 1.08)
Specialist review in 24 hours (yes/no)				
Death within 30 days of admission	0.99	(0.85 – 1.16)	1.10	(0.94 – 1.29)
Death within 90 days of admission	1.02	(0.93 – 1.11)	**1.13**	**(1.03 – 1.24)**
Readmission within 30 days of discharge	**0.94**	**(0.89 – 0.99)**	0.95	(0.90 – 1.01)
Readmission within 90 days of discharge	0.98	(0.93 – 1.03)	1.01	(0.96 – 1.07)
Received specialist review (yes/no)				
Death within 30 days of admission	1.08	(0.90 – 1.30)	1.06	(0.86 – 1.30)
Death within 90 days of admission	**1.26**	**(1.13 – 1.41)**	**1.17**	**(1.03 – 1.32)**
Readmission within 30 days of discharge	**1.08**	**(1.01 – 1.16)**	0.98	(0.91 – 1.05)
Readmission within 90 days of discharge	**1.08**	**(1.02 – 1.15)**	1.03	(0.96 – 1.10)
Time to specialist review (≤24hrs/>24hrs)				
Death within 30 days of admission	0.94	(0.78 – 1.12)	1.12	(0.93 – 1.36)
Death within 90 days of admission	**0.89**	**(0.80 – 0.99)**	1.11	(0.99 – 1.24)
Readmission within 30 days of discharge	**0.87**	**(0.82 – 0.94)**	0.95	(0.88 – 1.02)
Readmission within 90 days of discharge	**0.93**	**(0.87 – 0.98)**	1.00	(0.94 – 1.06)
Discharge bundle (yes/no)**				
Death within 30 days of admission	0.87	(0.74 – 1.02)	0.86	(0.71 – 1.03)
Death within 90 days of admission	0.96	(0.88 – 1.06)	**0.88**	**(0.79 – 0.98)**
Readmission within 30 days of discharge	1.01	(0.95 – 1.07)	0.97	(0.90 – 1.04)
Readmission within 90 days of discharge	1.05	(0.99 – 1.10)	1.02	(0.96 – 1.09)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
**Additionally adjusted for receipt of respiratory specialist review.
Notes: Statistically significant results in bold.
Abbreviations: BPT: Best Practice Tariff; CI: confidence interval COPD: chronic obstructive pulmonary disease.

Supplementary Table S17. Odds ratios and 95% confidence intervals for mortality and readmission for people discharged from hospital following acute exacerbation of COPD who were admitted to a hospital where 60% or more of admissions conformed to the COPD BPT relative to admissions to people admitted to a hospital where less than 60% of admissions conformed to the COPD BPT.

60% of admissions COPD BPT conforming	**Odds ratio (95% CI)**	**Adjusted* odds ratio (95% CI)**
Death within 30 days of admission	1.15 (0.91 – 1.47)	1.16 (0.91 – 1.47)
Death within 90 days of admission	1.02 (0.88 – 1.19)	1.03 (0.88 – 1.21)
Readmission within 30 days of discharge	1.05 (0.96 – 1.15)	1.04 (0.95 – 1.15)
Readmission within 90 days of discharge	**1.09 (1.00 – 1.18)**	1.09 (1.00 – 1.19)

*Adjusted for age, sex, socioeconomic status, oxygen requirement, non-invasive ventilation requirement, length of stay, smoking status, Charlson comorbidity index, and mental health diagnoses.
Notes: Statistically significant results in bold.
Abbreviations: BPT: Best Practice Tariff; CI: confidence interval; COPD: chronic obstructive pulmonary disease.