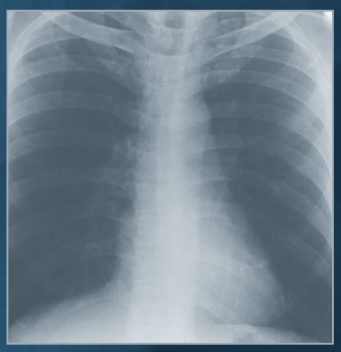
National COPD Audit Programme



COPD: Who cares when it matters most?

National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Outcomes from the clinical audit of COPD exacerbations admitted to acute units in England 2014

Results and data analysis
February 2017

Prepared by:

Royal College of Physicians

British Thoracic Society

In partnership with:

PCRS Primary Care Respiratory Society UK

RCGP Royal College of General Practitioners

British Lung Foundation

Commissioned by:

Working in wider partnership with:

The Royal College of Physicians

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Healthcare Quality Improvement Partnership (HQIP)

The National COPD Audit Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit (NCA) Programme. HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement, and in particular to increase the impact that clinical audit has on healthcare quality in England and Wales. HQIP holds the contract to manage and develop the NCA Programme, comprising more than 30 clinical audits that cover care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual audits, also funded by the Health Department of the Scottish Government, DHSSPS Northern Ireland and the Channel Islands.

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Section 1: Case ascertainment

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HES files for 2013/2014 and 2014/2015 were used to capture all patients recorded as having at least one COPD admission (codes J44.0, J44.1, J44.8, J44.9) to English hospitals within the National Secondary Care COPD Audit period of 1 February – 30 April 2014.

The total number of patients with COPD admissions to English hospitals recorded by HES during the audit period was 26664, with 31789 distinct admissions.

The total number of patients in the National Secondary Care COPD audit was 13414, of which 12594 were admitted to 183 English units within 142 trusts, with 100% of English trusts participating in the audit. The other 820 audit patients were admitted to Welsh units.

On this basis, the case ascertainment rate for the National Secondary Care COPD audit for England was 47% (12594/26664).

The National Secondary Care COPD audit specifically asked units for their total number of eligible cases (coded COPD admissions) during the audit period. This was stated by 165 of the English units and totalled 19879. These 165 units actually contributed 11608 cases to the audit, representing 58% of the total eligible. The median (interquartile range (IQR)) percentage of audit cases out of total number of eligible cases was 66% (48–91%). It was noted within the clinical audit report[1] that larger units, in particular, struggled with the audit workload asked of them.

[1] Stone RA, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, Roberts CM. *COPD: Who cares matters. National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Clinical audit of COPD exacerbations admitted to acute units in England and Wales 2014.* National clinical audit report. London: RCP, February 2015. www.rcplondon.ac.uk/projects/outputs/copd-who-cares-matters-clinical-audit-2014 [Accessed December 2016]

Section 2: Inpatient mortality

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Key findings/observations

- Inpatient mortality has **reduced** historically:
  - 7.9% 2003
  - 7.8% 2008
  - 4.3% 2014.
- COPD accounted for **three-quarters** of coded causes of inpatient death.
- The extended weekend (Friday, Saturday, Sunday and Monday) was associated with a small increase in mortality (4.6% v 3.8%).
- A number of other factors were associated with higher inpatient mortality:
  - increasing **age**
  - increasing number of **comorbidities**
  - presence of **chest X-ray consolidation**
  - **higher MRC** score in the weeks prior to admission
  - **higher GOLD** stage
  - higher modified **DECAF** score
  - initial **acidotic pH** (especially if <7.26)
  - need for **assessment by the ITU** team during admission
  - treatment with **non-invasive ventilation (NIV)**.
- Inpatient mortality was **four times higher** than average for patients who **received NIV** (17%).
- Mortality for patients receiving NIV began to **rise** between 1 and 3 hours after admission. It was particularly high (33%) in those patients who **received NIV 24 hours or more** after admission.
- There was no clear relationship between deprivation and inpatient mortality.
- There was good agreement between Hospital Episode Statistics (HES) and the audited case data for inpatient mortality.

Suggested areas for improvement

- Continue to work on achieving **early respiratory specialist review**.
- Review systems to ensure that there is **early adoption of escalation plans**, including progression or non-progression to **NIV**.
- Incorporate within the admission pro-forma a range of predictive information to include the **pH, DECAF score,** recent **MRC score**, disease severity as judged by either **GOLD stage** or **% predicted FEV_1**, and the **chest X-ray** appearance.

Navigation

This section contains the following tables. If viewing this report on a computer, you can select the chart that you wish to view by selecting it from the list below.

Section 2.1: General inpatient mortality

2.1a Difference between auditor-entered and HES-derived inpatient mortality data

The ONS mortality data originally provided to the National COPD Audit Programme from NHS Digital (formally the Health and Social Care Information Centre) included solely month and year of death. Day of death was removed for reasons of confidentiality. Without the actual day of death, it was impossible in some cases to ascertain whether the death was within the index audit admission or within a readmission. We used other audit information (such as being discharged home) and clinical judgement to decide one way or the other. Thus, for England, 577 inpatient deaths were reduced to 523 deaths, giving an inpatient mortality rate of 4.2% (523/12594).

From HES data, as applied to audit patients within the audit period, patients were counted as having died as inpatients if either of the following two codes were recorded:

- DISDEST1 (destination on discharge): code 79 = not applicable (patient died or stillbirth)
- DISMETH (method of discharge): code 4 = died.

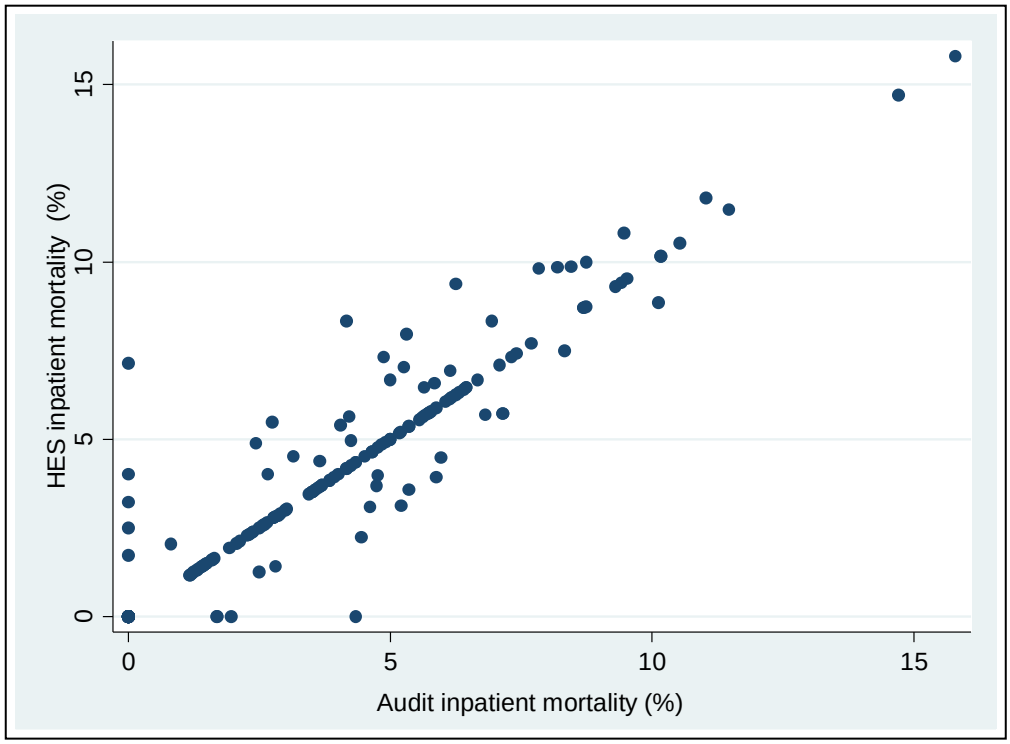
In this way, 540 inpatient deaths were noted in HES for audit patients during the audit period: a rate of 4.3% (540/12594), 95% confidence interval 3.9–4.7%. The HES index admission date was within ±1 day of the audit index admission date for 97% (524/540) of these deaths.

Of the 523 inpatient deaths from audit data alone, 94% (493/523) were confirmed by HES. The confirmation rate regarding the 577 deaths was lower at 89% (512/577), indicating that it was appropriate to make the adjustments within the audit dataset.

The table below indicates that, at unit level, for audit patients there was good agreement between the number of inpatient deaths as derived by auditors and from HES (kappa coefficient of agreement 0.69, standard error 0.04). For 73% (134/183) of units there was exact agreement, for 11% (20/183) the number of deaths was higher as reported by auditors, and for 16% (29/183) the number was higher from HES.

		Number of inpatient deaths from audit-derived data (total 523) from 183 English units											
		0	1	2	3	4	5	6	7	8	9	10	14	Total
Number of inpatient deaths from HES-derived data (total 540) from 183 English units	0	29	3	1	–	–	–	–	–	–	–	–	–	33
	1	4	35	2	–	–	–	–	–	–	–	–	–	41
	2	1	2	20	3	1	–	–	–	–	–	–	–	27
	3	–	–	3	16	1	1	–	–	–	–	–	–	21
	4	–	–	1	2	10	2	–	–	–	–	–	–	15
	5	–	–	1	–	1	9	2	–	–	–	–	–	13
	6	–	–	–	–	–	3	5	–	–	–	–	–	8
	7	–	–	–	–	–	–	2	3	1	1	–	–	7
	8	–	–	–	–	–	–	2	3	5	–	–	–	10
	9	–	–	–	–	–	–	1	–	2	1	1	–	5
	10	–	–	–	–	–	–	–	1	–	–	1	–	2
	15	–	–	–	–	–	–	–	–	–	–	–	1	1
	Total	34	40	28	21	13	15	12	7	8	2	2	1	183

HES v audit inpatient mortality rates in audit patients for the 183 units



Further analysis of inpatient mortality within this report will focus on outcomes provided by HES data, with an overall rate of 4.3% (540/12594) for England.

2.1b Inpatient mortality: historical comparison with audits in 2003 and 2008

In both the 2003 and 2008 audits, auditors were asked for the date of death and it was possible, from audit data, to ascertain whether the death occurred during the index audit admission.

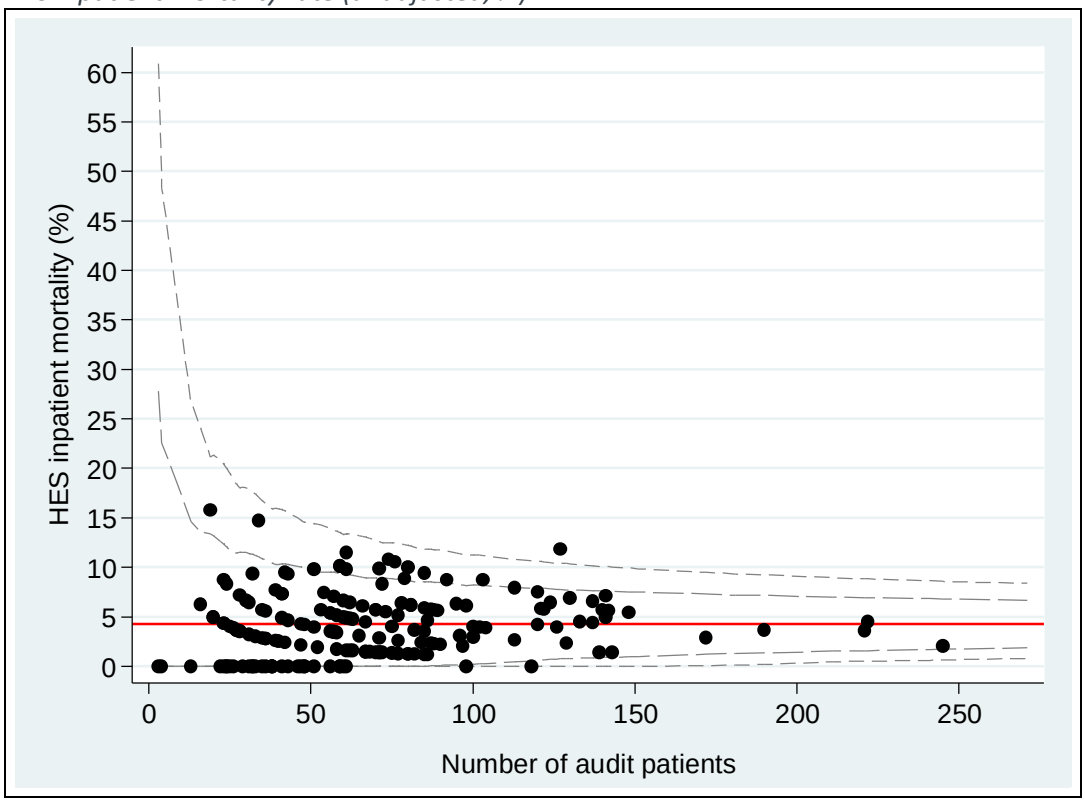
The inpatient mortality rates in the previous two audits for England were:

- 2008 audit: 7.8% (613/7851)
- 2003 audit: 7.9% (450/5684).

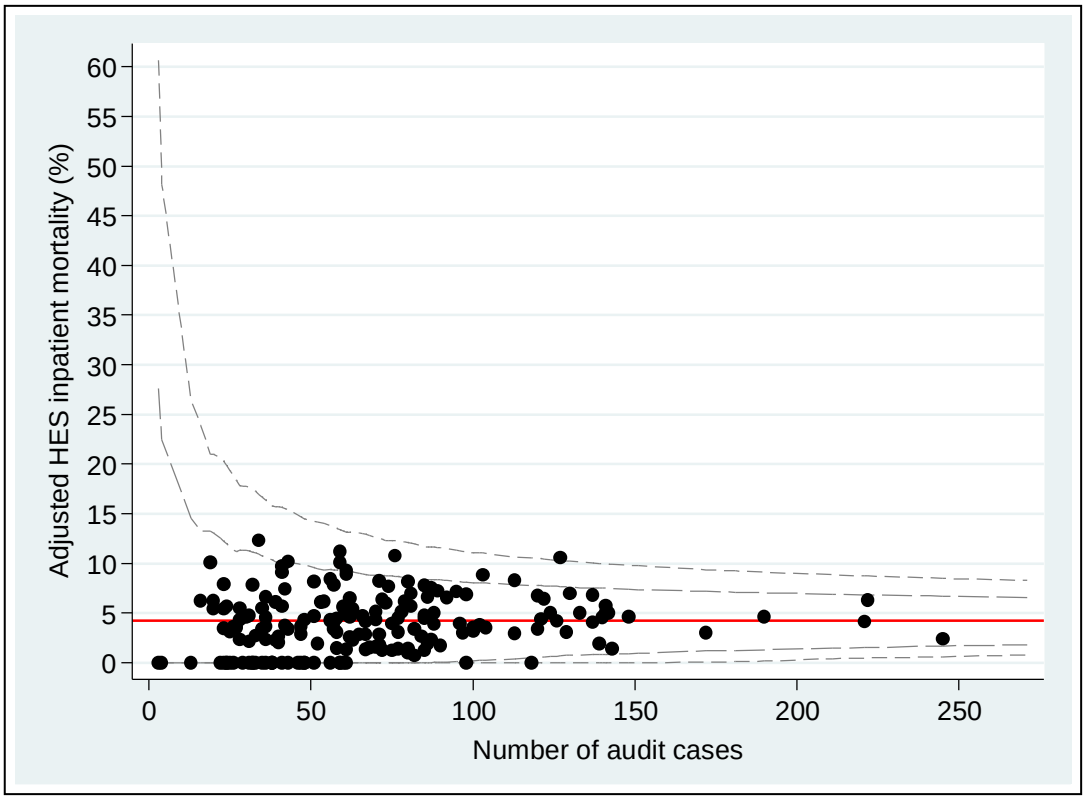
2.1c Inpatient mortality: scatter plot by unit

The graphic below is known as a 'funnel plot', and it shows unit inpatient HES mortality rate for audit patients plotted against unit audit sample size, in comparison to a (red) line that indicates the overall national result (4.3%) and dotted lines that indicate limits of control. Control limits serve as boundaries, and any results falling above the upper boundary or below the lower boundary are considered to be statistical outliers. The chance of results being outside these limits owing to chance alone is small (5% for the inner and 0.2% for the outer limits), so when results do fall outside, these are inconsistent with the overall national result in relation to their sample size. This implies that something else is happening, non-random in nature, probably systematic organisational differences rather than randomness of scatter.

HES inpatient mortality rate (unadjusted, %)



HES inpatient mortality rate (%) after adjustment in logistic regression for initial pH value (<7.26, 7.26–7.34, ≥7.35, no blood gases) and age group (<55, 55–64, 65–69, 70–74, 75–79, 80–84, ≥85)



2.1d Inpatient mortality: breakdown by cause

Office for National Statistics (ONS) data on cause of inpatient death were grouped into five categories, namely COPD (ICD codes J44.0, J44.1, J44.8, J44.9, pneumonia (J18.9, J18.0, J18.1), other respiratory (all J codes minus the COPD and pneumonia codes), cardiovascular (ICD codes I00 to I99), other (all other codes). COPD codes featured as the most common reason for death during the index admission.

Cause of inpatient death	Number of deaths (% of 540)	% of 12594 audit patients
COPD	410 (76%)	3.3%
Pneumonia	7 (1%)	<0.01%
Other respiratory	21 (4%)	0.2%
Cardiovascular	41 (8%)	0.3%
Other	61 (11%)	0.5%
Total	**540 (100%)**	**4.3%**

Section 2.2: Inpatient mortality in relation to multiple variables

2.2a Inpatient mortality: relation to deprivation

Deprivation covers a broad range of issues, and refers to unmet needs caused by a lack of resources of all kinds. England produces its own separate index of multiple deprivation (IMD) using postcodes, and for this audit patient postcodes at the time of index admission were used. The IMD 2010 ranks 32482 small geographical areas within England, from most deprived (rank 1) to least deprived (rank 32482). For the purpose of presentation, these areas were grouped into quintiles, with the most deprived quintile comprising ranks 1–6496, the next quintile comprising ranks 6497–12993, and so on up to the least deprived quintile (ranks 25986–32482). There appeared to be no relationship between deprivation and inpatient death.

National IMD quintile	Inpatient mortality	
Q1 (most deprived)	3.6%	145/4012
Q2	4.0%	115/2902
Q3	5.3%	121/2284
Q4	4.6%	83/1815
Q5 (least deprived)	4.7%	59/1258
Not known	5.3%	17/323
Total	**4.3%**	

Chi-squared test between quintile groups (excluding not known): P=0.02

2.2b Inpatient mortality: relation to age

There was a clear relationship between increasing age and inpatient mortality, particularly for those aged 85 or older.

Patient age (years)	Inpatient mortality	
<55	0.6%	5/807
55–64	2.2%	49/2202
65–69	3.9%	77/1994
70–74	4.4%	97/2224
75–79	3.9%	83/2133
80–84	5.7%	98/1722
≥85	8.7%	131/1511
Total	**4.3%**	**540/12593**[†]

[†]Age was not known for one patient

Chi-squared test between age groups (excluding Not known): P<0.001

2.2c Inpatient mortality: relation to comorbidity

The audit asked whether the patient had any other significant medical conditions, and multiple responses were possible. There were associations with not just cardiovascular problems, but also dementia/confusion, mental health disorder (low mortality), kidney disease and osteoporosis. Mortality relates also to the number of comorbidities.

	Inpatient mortality	
Overall	**4.3%**	**540/12594**
In patients with:		
Alcohol-related condition	4.3%	19/443
Atrial fibrillation	6.5%***	95/1471
Cor pulmonale	8.2%***	34/413
Dementia/confusion	9.3%***	51/546
Diabetes	4.0%	79/1981
Hearing impairment	7.6%	9/118
Hypertension	4.2%	166/3960
Ischaemic heart disease (IHD)	4.3%	111/2599
Kidney disease	6.8%***	59/869
Left heart failure (LVF)	8.3%***	66/794
Locomotor problems	3.5%	51/1438
Lung cancer	9.7%***	31/321
Mental health disorder	2.4%***	33/1353
Neurological condition	3.1%	21/668
Osteoporosis	6.1%**	54/883
Stroke	4.8%	40/832
Thromboembolic disease (pulmonary embolism (PE), deep-vein thrombosis (DVT))	3.8%	20/530
Visual impairment	4.5%	14/314
Other respiratory disease	4.4%	73/1674
Other cardiovascular disease	5.1%	71/1399
Other endocrine disorder	3.8%	32/832
Other gastrointestinal condition	4.7%	68/1445
Other malignant disease	6.2%**	61/989

***P<0.001, **0.001≤P<0.01, *0.01≤P<0.05 (Fisher's exact test for presence v absence of specified condition)

Number of significant medical conditions	Inpatient mortality	
None	2.9%	49/1670
One	3.9%	133/3369
Two	4.7%	156/3313
Three	3.9%	90/2279
Four or more	5.7%	112/1963
Total	**4.3%**	**540/12594**

Chi-squared test between categories: P<0.001

2.2d Inpatient mortality: relation to day of the week of admission

We assessed inpatient mortality according to the day of admission. For the extended Easter weekend of Friday through Monday inclusive, the rate was 4.6% (334/7202), in comparison with the Tuesday through Thursday rate of 3.8% (206/5392), P=0.03 (Fisher's exact test). For Saturday, Sunday and the Easter weekend (4 days, which fell during the audit period) combined, the inpatient mortality was 4.9% (175/3580) in comparison with the weekday rate of 4.0% (365/9014), P=0.04 (Fisher's exact test).

Day of week of admission	Inpatient mortality	
Monday	4.2%	91/2179
Tuesday	3.5%	68/1931
Wednesday	4.6%	81/1753
Thursday	3.3%	57/1708
Friday	4.6%	74/1618
Saturday	5.1%	83/1627
Sunday	4.8%	86/1778
Total	**4.3%**	**540/12594**

Chi-squared test between days: P=0.08

2.2e Inpatient mortality: relation to chest X-ray consolidation v no consolidation

Inpatient mortality was higher in patients with evidence of chest X-ray consolidation.

Chest X-ray consolidation	Inpatient mortality	
Yes	6.7%	148/2193
No	3.6%	335/9320
Not known from X-ray	6.4%	40/627
No X-ray	3.7%	17/454
Total	**4.3%**	**540/12594**

Fisher's exact test (Yes v No): P<0.001

2.2f Inpatient mortality: relation to MRC score as estimated in the weeks prior to the admission

Inpatient mortality was higher in patients with higher MRC breathlessness scores.

MRC score	Inpatient mortality	
Grade 1 – not troubled by breathlessness except on strenuous exercise	0.6%	2/324
Grade 2 – short of breath when hurrying or walking up a slight hill	1.2%	8/667
Grade 3 – walks slower than contemporaries on level ground because of breathlessness or has to stop for breath	1.8%	24/1311
Grade 4 – stops for breath after walking about 100 metres (109 yards) or after a few minutes on level ground	2.8%	75/2652
Grade 5 – too breathless to leave the house or breathless when dressing or undressing	7.8%	210/2689
Not known / not recorded	4.5%	221/4951
Total	**4.3%**	**540/12594**

Chi-squared test between five grades: P<0.001

2.2g Inpatient mortality: relation to % predicted FEV_1/GOLD stage, where known

Inpatient mortality increased in tandem with disease severity.

GOLD stage	Inpatient mortality	
Stage I: Mild, ≥80% predicted FEV_1	2.8%	8/286
Stage II: Moderate, 50–79% predicted FEV_1	2.1%	31/1461
Stage III: Severe, 30–49% predicted FEV_1	3.2%	69/2189
Stage IV: Very severe, <30% predicted FEV_1	5.7%	75/1323
Not known	4.9%	357/7335
Total	**4.3%**	**540/12594**

Chi-squared test between known categories: P<0.001

2.2h Inpatient mortality: relation to modified DECAF scores, where known

The DECAF score (**d**yspnoea, **e**osinopenia, **c**onsolidation, **a**cidaemia, **f**ibrillation) is increasingly used by clinicians admitting patients with COPD exacerbation as its role in risk assessment becomes better understood.

A modified DECAF score was computed for 5216 patients, or 41% of the total of 12594. This modified score ranges from 0–5 instead of the recommended 0–6, and this is because we could not distinguish between MRC dyspnoea grade 5a (score 1) and grade 5b (score 2), and hence a score of 1 was given to all MRC grade 5. Missing data for any component of the DECAF score meant that the score could not be computed – the component most affected was MRC dyspnoea score.

Modified DECAF score (range 0–5):

- Score 1 if MRC dyspnoea grade 5
- Score 1 if eosinophil count <0.05
- Score 1 if chest X-ray demonstrated consolidation
- Score 1 if pH on admission <7.3
- Score 1 if atrial fibrillation comorbidity
- Otherwise score 0

Modified DECAF score	Inpatient mortality	
0	0.7%	10/1353
1	3.2%	67/2114
2	7.6%	95/1249
3	14.6%	61/418
4	28.2%	22/78
5	50.0%	2/4
Not known	3.8%	283/7378
Total	**4.3%**	**540/12594**

Chi-squared test between score categories (0, 1, 2, 3, 4–5): P<0.001

2.2i Inpatient mortality: relation to initial pH

Inpatient mortality was higher in those whose initial blood pH was acidotic.

Initial pH	Inpatient mortality	
<7.26	19.5%	121/619
7.26–7.34	8.8%	135/1529
≥7.35	3.2%	244/7510
Not known	1.4%	40/2936
Total	**4.3%**	**540/12594**

Chi-squared test between known categories: P<0.001

2.2j Inpatient mortality: breakdown by whether treated or not treated with NIV

Inpatient mortality was much higher in those treated acutely with NIV. It was even higher in patients who declined the treatment.

Treated with NIV	Inpatient mortality	
Yes	16.9%	255/1508
No – not clinically indicated	2.0%	215/10509
No – patient declined	30.0%	30/100
No – NIV not available	8.0%	2/25
No – reason unclear	7.8%	23/296
Patient intubated directly	27.6%	8/29
Not known	5.5%	7/127
Total	**4.3%**	**540/12594**

Chi-squared test between known categories: P<0.001

2.2k Inpatient mortality: for those treated with NIV, relationship between time from admission and time to NIV (where timings known)

Timings for when NIV was given were known for 1118 of the 1508 patients treated with NIV. Although numbers were small, there was a clear relationship between delay to receipt of NIV after admission and higher mortality rates. This was especially noticeable for patients who received NIV more than 24 hours after admission. Mortality rates began to rise between the 1- and 3-hour time points.

Time to NIV	Inpatient mortality	
Treated before admission:		
≥12 but <24 hours	25.0%	2/8
<12 hours	7.4%	6/81
Treated after admission:		
<30 minutes	12.9%	8/62
30–59 minutes	12.0%	10/83
60–179 minutes	13.9%	34/244
3–24 hours	15.5%	68/438
>24 hours	33.7%	68/202
Total	**17.5%**	**196/1118**

Section 3: Mortality at 30/90 days after index admission

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Key findings/observations

- There has been a historical **reduction** in 90-day mortality from the date of admission:
  - 16.3% 2003
  - 14.2% 2008
  - 12.0% 2014.
- For those patients discharged alive, mortality was **2.8% within 30 days of admission** and **8.0% within 90 days of admission** (ie 35% of the deaths occurred within 30 days, and the remaining 65% between 30 and 90 days).
- Those patients who received **NIV** were, however, at **particular risk of death within 30 days of admission** (20.2% mortality within 30 days, 27.7% within 90 days).
- Mortality within 90 days of discharge was higher for patients who were admitted on a Saturday/Sunday, and over the extended Easter weekend (which fell during the audit period), than for those admitted on weekdays.
- For patients discharged alive, **longer lengths of stay** were related to increased mortality within both 30 days (9.9%) and 90 days (22.6%).
- While COPD was overwhelmingly the main cause of death at 30/90 days (71%/67% of deaths), cardiovascular disease was the next most common cause (9%/11% of deaths).
- A number of other factors were associated with higher 30/90-day mortality:
  - increasing age
  - dementia/confusion
  - kidney disease
  - osteoporosis
  - prolonged length of stay
  - presence of consolidation on the chest X-ray
  - increasing DECAF score, where measurable
  - declining treatment with NIV
  - being managed on a respiratory/medical HDU.
- There was no notable relationship between 30/90-day mortality and IMD deprivation, even after stratifying for age (which correlated with IMD).

Suggested areas for improvement

- Continue to work on achieving **early respiratory specialist review**.
- Review systems to ensure that there is **early adoption of escalation plans**, including progression or non-progression to **NIV**.
- Incorporate within the admission pro-forma a range of predictive information to include the **pH, DECAF score**, recent **MRC score**, disease severity as judged by either **GOLD stage** or **% predicted FEV_1**, and the **chest X-ray** appearance.

Navigation

This section contains the following tables. If viewing this report on a computer, you can select the chart that you wish to go to by selecting it from the list below.

Section 3.1: General mortality at 30/90 days after the index admission

3.1a 30/90-day mortality: % dead/alive

We received ONS data for audit patients who had died up to year 2014/2015, which also included the codes for the cause of death. From the information received, we are able to report 30-day and 90-day mortality for audit patients in England.

Mortality within 30 days of index audit admission: 6.7% (846/12594), 95% confidence interval: 6.3–7.2%.

Mortality within 90 days of index audit admission: 12.0% (1508/12594), 95% confidence interval: 11.4–12.6%.

3.1b 30/90-day mortality: historical comparison for 90 days with the audits of 2003 and 2008

The 90-day mortality rates for England from the previous two audits were:

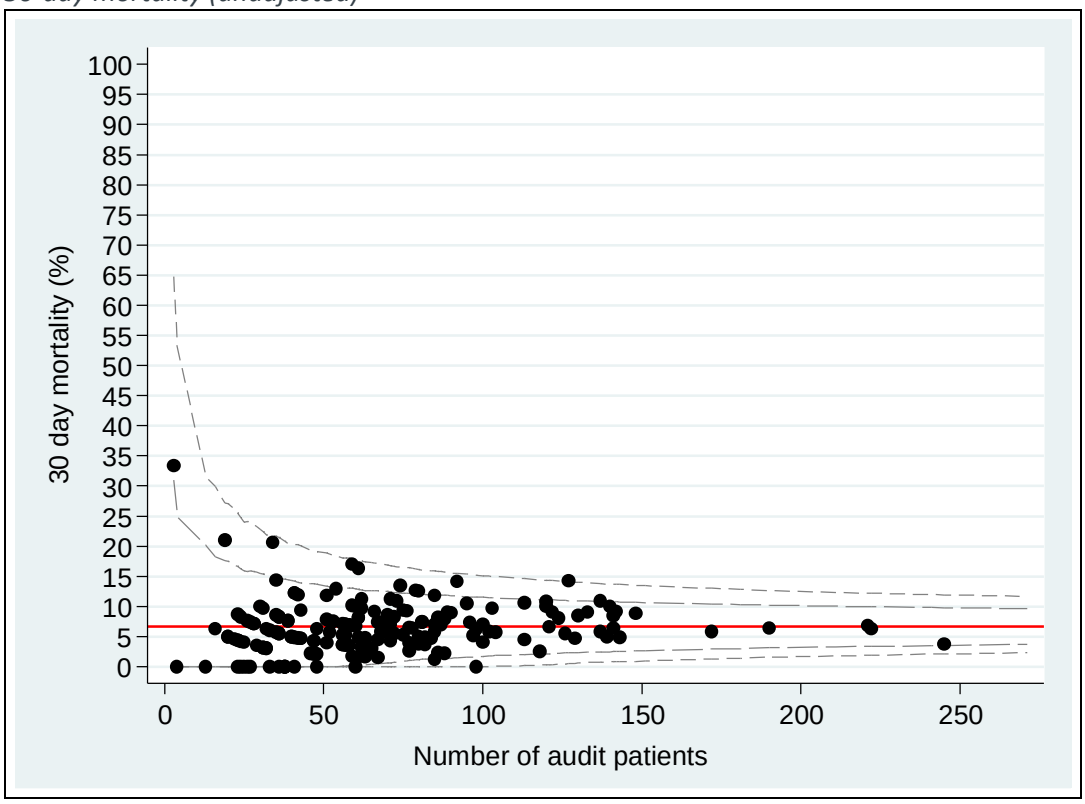
- 2008 audit: 14.2% (1065/7526)
- 2003 audit: 16.3% (922/5652).

3.1c 30/90-day mortality: scatter plot by unit

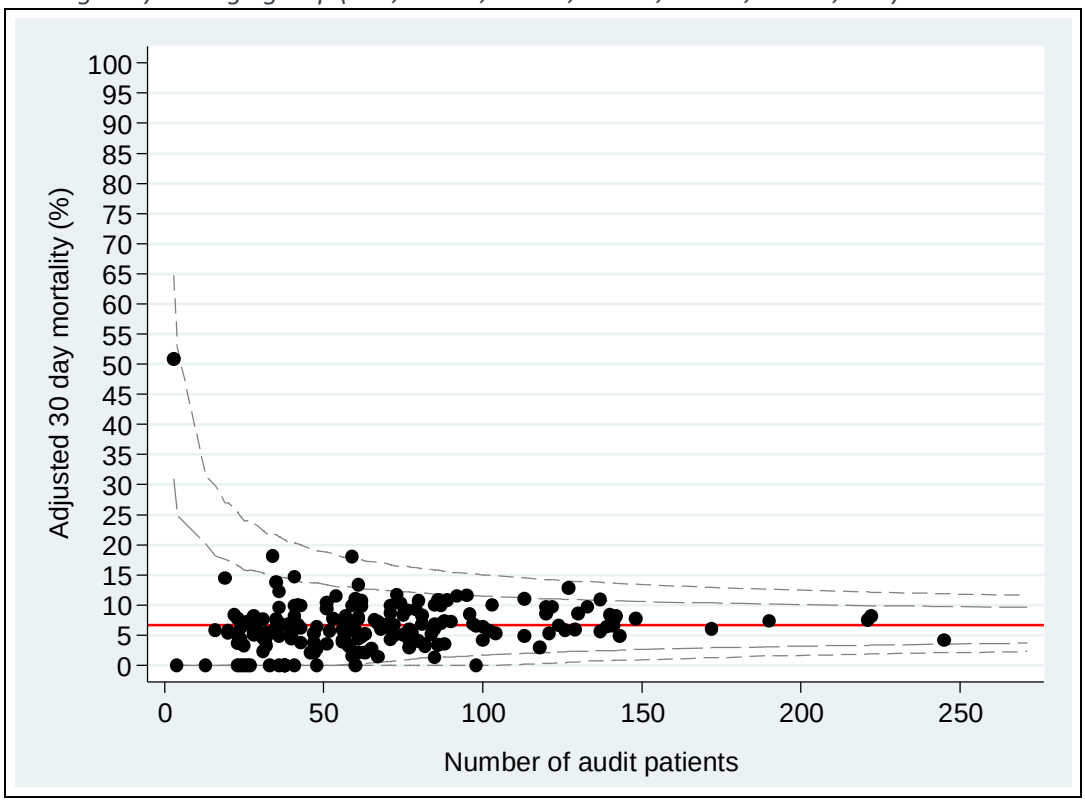
The two graphics below are ‘funnel plots’ that show unit mortality rates for audit patients plotted against unit audit sample size, in comparison to a (red) line that indicates the overall national result and dotted lines that indicate limits of control. Control limits serve as boundaries, and any results falling above the upper boundary or below the lower boundary are considered to be statistical outliers. The chance of results

being outside these limits owing to chance alone is small (5% for the inner and 0.2% for the outer limits), so when results do fall outside, these are inconsistent with the overall national result in relation to their sample size. This implies that something else is happening, non-random in nature, probably systematic organisational differences rather than randomness of scatter.

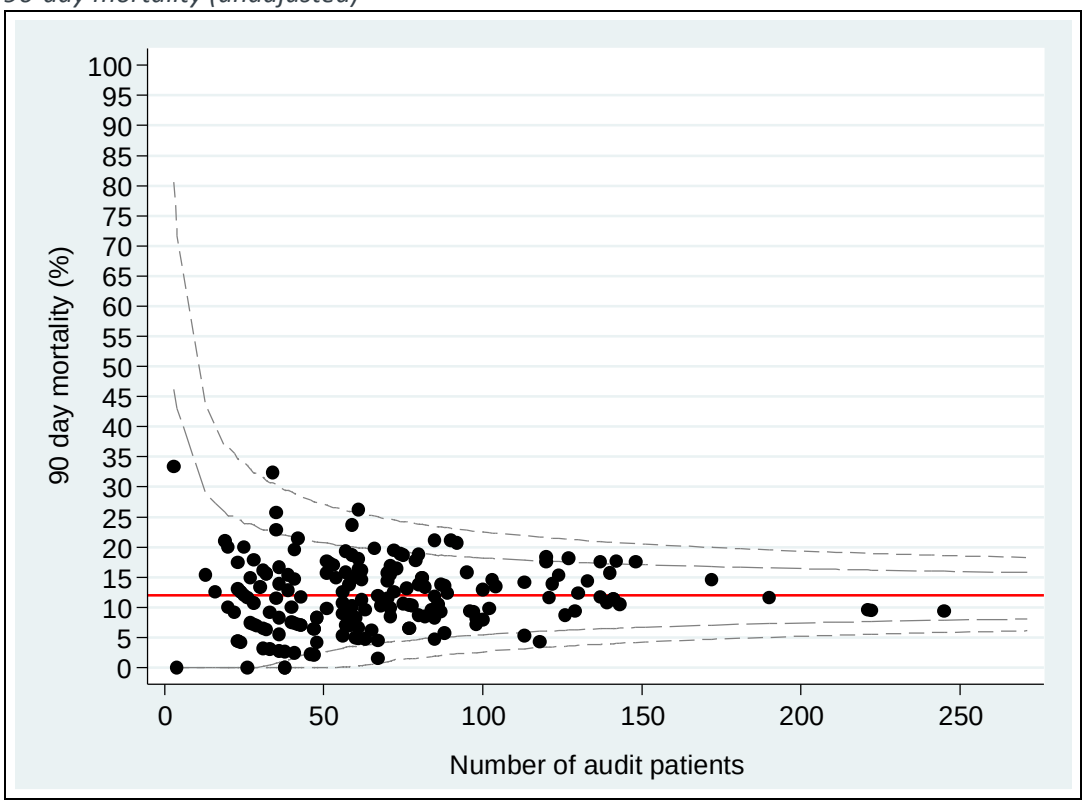
30-day mortality (unadjusted)



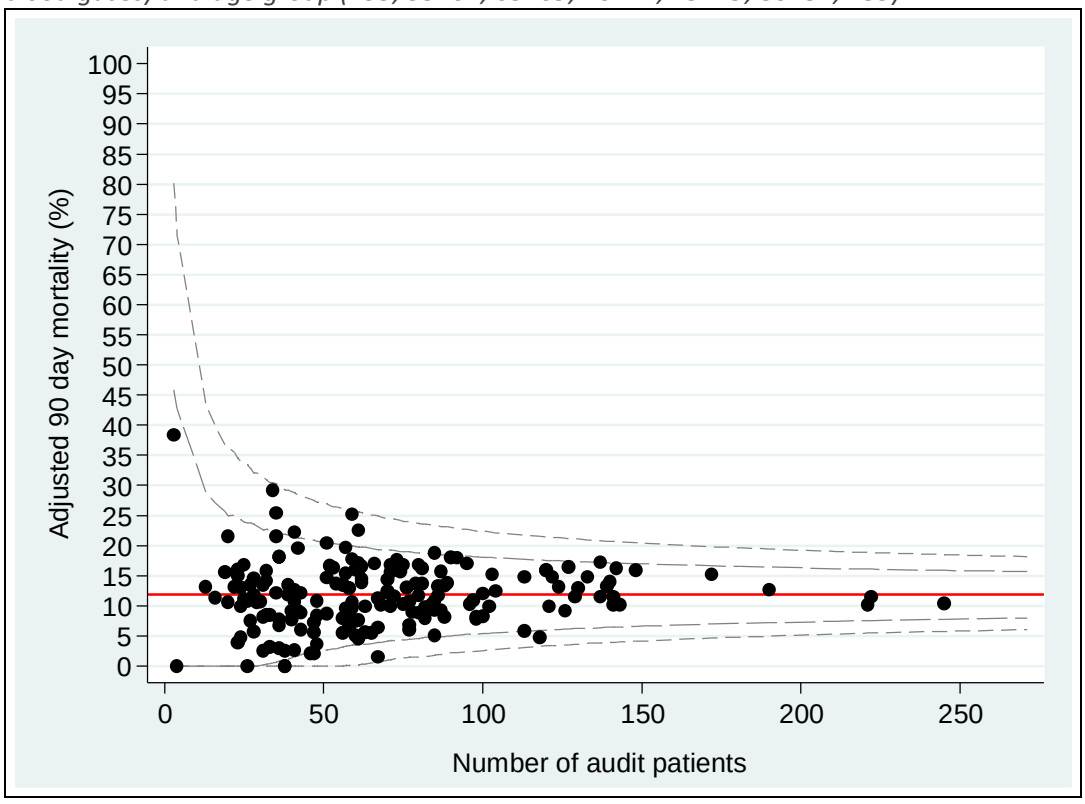
30-day mortality after adjustment in logistic regression for initial pH value (<7.26, 7.26–7.34, ≥7.35, no blood gases) and age group (<55, 55–64, 65–69, 70–74, 75–79, 80–84, ≥85)



90-day mortality (unadjusted)



90-day mortality after adjustment in logistic regression for initial pH value (<7.26, 7.26–7.34, ≥7.35, no blood gases) and age group (<55, 55–64, 65–69, 70–74, 75–79, 80–84, ≥85)



3.1d 30/90-day mortality: breakdown by cause

ONS data on cause of inpatient death was grouped into five categories, namely COPD (ICD codes J44.0, J44.1, J44.8, J44.9, pneumonia (J18.9, J1.80, J18.1), other respiratory (all J codes minus the COPD and pneumonia codes), cardiovascular (ICD codes I00 to I99), other (all other codes).

Mortality within 30 days of audit index admission	Number of deaths ≤30 days (% of 846)	Deaths as % of 12594 audit patients	Number of deaths ≤90 days (% of 1508)	Deaths as % of 12594 audit patients
COPD	601 (71%)	4.8%	1007 (67%)	8.0%
Pneumonia	8 (0.9%)	<0.01%	22 (1.5%)	0.2%
Other respiratory	40 (4.7%)	0.3%	74 (4.9%)	0.6%
Cardiovascular	78 (9.2%)	0.6%	160 (11%)	1.3%
Other	119 (14%)	0.9%	245 (16%)	1.9%
Total	**846 (100%)**	**6.7%**	**1508 (100%)**	**12.0%**

Section 3.2: Mortality at 30/90 days by variable

3.2a 30/90-day mortality: breakdown by deprivation

England produces its own separate index of multiple deprivation (IMD) using postcodes, and 32482 small geographical areas within England are ranked from most deprived (rank 1) to least deprived (rank 32482). For the purpose of presentation, these areas were grouped into quintiles, with the most deprived quintile comprising ranks 1–6496, the next quintile comprising ranks 6497–12993, and so on up to the least deprived quintile (ranks 25986–32482). There was no notable relationship between 30/90-day mortality and IMD deprivation (below), even after stratifying for age (which correlated with IMD – results not shown).

National IMD quintile	Mortality ≤30 days		Mortality ≤90 days	
Q1 (most deprived)	5.6%	225/4012	10.6%	425/4012
Q2	6.7%	194/2902	11.9%	344/2902
Q3	7.7%	175/2284	12.9%	295/2284
Q4	7.3%	132/1815	13.1%	238/1815
Q5 (least deprived)	7.6%	95/1258	13.5%	170/1258
Not known	7.7%	25/323	11.1%	36/323
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Chi-squared test between quintile groups (excluding not known): P=0.009 and P=0.007, respectively for 30 and 90 days

3.2b 30/90-day mortality: breakdown by age

As for inpatients, there was an age-related increase in deaths within 30 and 90 days.

Patient age (years)	Mortality ≤30 days		Mortality ≤90 days	
<55	1.9%	15/807	3.0%	24/807
55–64	3.3%	73/2202	6.3%	139/2202
65–69	6.5%	130/1994	11.1%	222/1994
70–74	6.3%	141/2224	11.2%	248/2224
75–79	7.0%	149/2133	12.9%	275/2133
80–84	8.4%	145/1722	15.4%	265/1722
≥85	12.8%	193/1511	22.2%	335/1511
Total	**6.7%**	**846/12593**[†]	**12.0%**	**1508/12593**[†]

[†] Age was not known for one patient

Chi-squared test between age groups (excluding not known): both P<0.001

3.2c 30/90-day mortality: breakdown by comorbidities

The same range of comorbidities associated with deaths within 30 and 90 days.

Number of significant medical conditions	Mortality ≤30 days		Mortality ≤90 days	
None	4.7%	78/1670	8.3%	138/1670
One	5.8%	194/3369	10.2%	344/3369
Two	7.2%	237/3313	13.0%	430/3313
Three	6.7%	153/2279	12.4%	283/2279
Four or more	9.4%	184/1963	15.9%	313/1963
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Chi-squared test between categories: both P<0.001

	Mortality ≤30 days		Mortality ≤90 days	
Overall	6.7%	846/12594	12.0%	1508/12594
In patients with:				
Alcohol-related condition	6.3%	28/443	10.6%	47/443
Atrial fibrillation	9.4%***	139/1471	17.4%***	256/1471
Cor pulmonale	14.0%***	58/413	25.2%***	104/413
Dementia/confusion	13.6%***	74/546	23.8%***	130/546
Diabetes	6.7%	133/1981	12.4%	246/1981
Hearing impairment	9.3%	11/118	13.6%	16/118
Hypertension	6.5%	256/3960	11.1%*	449/3960
Ischaemic heart disease (IHD)	7.7%*	199/2599	13.3%*	346/2599
Kidney disease	10.2%***	89/869	18.0%***	156/869
Left heart failure (LVF)	13.6%***	108/794	20.0%***	159/794
Locomotor problems	5.9%	85/1439	11.0%	158/1438
Lung cancer	18.4%***	59/321	32.1%***	103/321
Mental health disorder	4.0%***	54/1353	8.6%***	116/1353
Neurological condition	6.0%	40/668	11.7%	78/668
Osteoporosis	9.1%**	80/883	15.3%**	135/883
Stroke	7.6%	63/832	13.6%	113/832
Thromboembolic disease (pulmonary embolism (PE), deep-vein thrombosis (DVT))	5.7%	30/530	11.1%	59/530
Visual impairment	6.4%	20/314	10.8%	34/314
Other respiratory disease	6.7%	112/1674	12.7%	212/1674
Other cardiovascular disease	7.9%	111/1399	13.6%	190/1399
Other endocrine disorder	5.0%*	42/832	10.2%	85/832
Other gastrointestinal condition	7.0%	101/1445	11.3%	163/1445
Other malignant disease	10.7%***	106/989	16.9%***	167/989

***P<0.001, **0.001≤P<0.01, *0.01≤P<0.05 (Fisher's exact test for presence v absence of specified condition)

3.2d 30/90-day mortality: relation to length of stay

Longer lengths of stay (LOS) associated with higher mortality within 30 and 90 days.

LOS (discharges and deaths)	Mortality ≤30 days		Mortality ≤90 days	
0–3 days	5.1%	288/5674	8.4%	475/5674
4–7 days	6.4%	233/3656	11.2%	409/3656
8–14 days	9.7%	198/2047	16.7%	342/2047
15 or more days	9.9%	117/1186	22.6%	268/1186
Not known	32.3%	10/31	45.2%	14/31
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Chi-squared test between known categories: both P<0.001

3.2e 30/90-day mortality: breakdown by day of the week of admission

There was a weak relationship between day of admission and mortality within 90 days of discharge.

Day of week of admission	Mortality ≤30 days		Mortality ≤90 days	
Monday	6.0%	131/2179	11.0%	239/2179
Tuesday	6.5%	125/1931	11.0%	212/1931
Wednesday	6.3%	111/1753	11.3%	198/1753
Thursday	6.6%	113/1708	12.1%	206/1708
Friday	7.1%	115/1618	12.1%	195/1618
Saturday	7.9%	128/1627	14.3%	232/1627
Sunday	6.9%	123/1778	12.7%	226/1778
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

For the extended weekend, Friday through Monday inclusive, the 90-day mortality rate was 12.4% (892/7202), in comparison with the Tuesday through Thursday rate of 11.4% (616/5392), P=0.10 (Fisher's exact test). For Saturday and Sunday combined, and for the Easter 4-day weekend (which fell during the audit period), the 90-day mortality rate was 13.2% (473/3580), in comparison with the weekday rate of 11.5% (1035/9014), P=0.007 (Fisher's exact test).

3.2f 30/90-day mortality: breakdown by day of the week of discharge

There was no notable relationship between day of discharge and post-discharge mortality within 30 or 90 days of admission.

Day of week of discharge	Mortality ≤30 days		Mortality ≤90 days	
Monday	2.1%	41/1964	7.0%	137/1964
Tuesday	2.5%	56/2238	8.0%	180/2238
Wednesday	3.6%	72/2028	8.9%	181/2028
Thursday	2.8%	58/2054	8.4%	173/2054
Friday	3.0%	66/2216	8.8%	194/2216
Saturday	2.4%	21/878	7.3%	64/878
Sunday	2.9%	19/654	5.4%	35/654
Not known	9.1%	2/22	22.7%	5/22
Total	**2.8%**	**335/12054**	**8.0%**	**969/12054**

Chi-squared test between known categories: P=0.15 and P=0.03, respectively for 30 and 90 days

3.2g 30/90-day mortality: relation to length of stay if discharged alive

For patients discharged alive, longer lengths of stay were related to increased mortality within 30 days of admission, although this relationship was more noticeable within 90 days.

LOS (discharges)	Mortality ≤30 days		Mortality ≤90 days	
0–3 days	2.0%	112/5496	5.4%	297/5496
4–7 days	3.0%	106/3528	8.0%	282/3528
8–14 days	4.1%	80/1928	11.6%	223/1928
15 or more days	3.2%	35/1080	15.0%	162/1080
Not known	9.1%	2/22	22.7%	5/22
Total	**2.8%**	**335/12054**	**8.0%**	**969/12054**

Chi-squared test between known categories: both P<0.001

3.2h 30/90-day mortality: relation to chest X-ray consolidation v no consolidation

As with inpatients, the presence of consolidation on the chest X-ray was associated with higher mortality within 30 and 90 days.

Chest X-ray consolidation	Mortality ≤30 days		Mortality ≤90 days	
Yes	9.2%	202/2193	15.9%	349/2193
No	5.9%	550/9320	10.8%	1009/9320
Not known from X-ray	9.9%	62/627	15.9%	100/627
No X-ray	7.0%	32/454	11.0%	50/454
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Fisher's exact test (Yes v No): both P<0.001

3.2i 30/90-day mortality: breakdown by modified inpatient DECAF, where available

As with inpatients, and with the caveat of smaller numbers, higher modified DECAF scores were associated with mortality within 30 and 90 days.

DECAF score	Mortality ≤30 days		Mortality ≤90 days	
0	2.1%	28/1353	5.3%	72/1353
1	5.4%	115/2114	10.1%	214/2114
2	10.6%	132/1249	17.1%	214/1249
3	19.6%	82/418	27.5%	115/418
4	29.5%	23/78	39.7%	31/78
5	25.0%	1/4	50.0%	2/4
Not known	6.3%	465/7378	11.7%	860/7378
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Chi-squared test between score categories (0, 1, 2, 3, 4, 5): both P<0.001

3.2j 30/90-day mortality: breakdown by whether NIV received

Deaths within 30 and 90 days were much higher for patients treated with, or declining, NIV during their admission.

Treated with NIV	Mortality ≤30 days		Mortality ≤90 days	
Yes	20.2%	304/1508	27.7%	417/1508
No – not clinically indicated	4.3%	447/10509	9.1%	958/10509
No – patient declined	38.0%	38/100	48.0%	48/100
No – NIV not available	16.0%	4/25	16.0%	4/25
No – reason unclear	11.5%	34/296	18.2%	54/296
Patient intubated directly	24.1%	7/29	27.6%	8/29
Not known	9.4%	12/127	15.0%	19/127
Total	**6.7%**	**846/12594**	**12.0%**	**1508/12594**

Chi-squared test between known categories: both P<0.001

Section 3.3: 30/90-day mortality for patients discharged alive

Mortality within 30 days of index audit admission: 2.8% (335/12054)

Mortality within 90 days of index audit admission: 8.0% (969/12054)

3.3a 30/90-day mortality: breakdown by whether discharged under the care of a COPD team or early/supported discharge service or equivalent

Patients discharged under the care of these services had very low mortality within 30 days of discharge, with the mortality also being lower within 90 days of discharge.

Evidence that patient was discharged under the care of a COPD team/early supported discharge service or equivalent	Mortality ≤30 days		Mortality ≤90 days	
Yes	2.2%	108/4920	6.9%	340/4920
Reviewed by early discharge scheme but not accepted	2.7%	28/1046	8.5%	89/1046
Not suitable for referral to early discharge scheme	5.4%	73/1353	12.6%	171/1353
Not recorded	2.7%	84/3155	8.1%	255/3155
Not available	2.7%	42/1580	7.2%	114/1580
Total	**2.8%**	**335/12054**	**8.0%**	**969/12054**

Chi-squared test between 3 known categories: Both P<0.001

3.3b 30/90-day mortality: breakdown by venue of discharge

Mortality was higher for those discharged to residential placement or community hospitals / rehabilitation wards or equivalent.

Patient was discharged to:	Mortality ≤30 days		Mortality ≤90 days	
Community hospital / rehabilitation ward or equivalent	3.8%	8/212	13.7%	29/212
Residential placement	8.6%	45/526	21.7%	114/526
Sheltered accommodation	2.4%	6/252	9.5%	24/252
House/flat alone	2.0%	73/3693	7.0%	259/3693
House/flat with another person	2.4%	147/6110	7.0%	425/6110
Other	8.7%	16/183	15.8%	29/183
Not known	3.7%	40/1078	8.3%	89/1078
Total	**2.8%**	**335/12054**	**8.0%**	**969/12054**

Chi-squared test between known categories: both P<0.001

Section 4: Length of stay (LOS)

Back to contents

Key findings/observations

- There has been a **historical reduction** in the median LOS:
  - 6 days 2003
  - 5 days 2008
  - 4 days 2014.
- **46%** of patients were **discharged within 3 days**, but 25% stayed more than 7 days.
- There was a **gradient relationship with age**, notably highest in those aged 85 years and above who had a median LOS of 5 days with 32% staying more than 7 days.
- LOS was noticeably **longer in those patients discharged to residential care** (median 6 days), **community hospitals** or **rehabilitation facilities** (median 9 days).
- There was no relationship between IMD deprivation and LOS.
- There was a clear association of longer LOS with:
  - increasing number of comorbidities
  - CXR consolidation
  - higher MRC score in the weeks prior to admission
  - higher GOLD stage
  - higher modified DECAF score, especially if greater than 1
  - lower initial pH, especially pH < 7.26 (median 7 days) and pH 7.26-7.34 (median 6 days)
  - lower second pH, especially pH < 7.26 (median 9 days) and pH 7.26-7.34 (median 7 days)
  - receipt of NIV (median 8 days)
  - receipt of NIV beyond 24 hours after admission (median 14 days).

Navigation

This section contains the following tables. If viewing this report on a computer, you can select the chart you wish to go to by selecting it from the list below.

- **4.2m Length of stay: by whose care patient under when discharged**
- **4.2n Length of stay: by whether discharged under the care of a COPD team or early/supported discharge service or equivalent**
- **4.2o Length of stay: by venue of discharge**
- **4.2p Length of stay: by age**
- **4.2q Length of stay: by suitability for/whether assessed for PR**

According to HES data, there were 540 deaths during the index admission and thus 12054 discharges. LOS was known from audit data for 12032.

The HES index date of admission was obtained by identifying the admission date in HES data that matched the COPD audit admission date. There was an exact match for 83% (9955/12032), ie there was an HES admission date that exactly matched the audit admission date. For 96% (11608/12032) of audit patients, the match was within ±1 day. For non-exact matches, the nearest HES admission date to the audit admission date was selected as the HES index date of admission. Where the nearest HES admission date was out of the scope of audit, then the nearest available date was computed (regardless of whether it was within, before or after the audit period).

The HES LOS was computed as the difference in days between the HES admission date and the discharge date for that admission. This HES LOS was in exact agreement with the audit-derived LOS for 75% (9035/12032) of audit patients, and for 92% (11049/12032) the agreement was within ±1 day.

The following analyses in this section use LOS as obtained directly from the audit.

For England, the median (IQR) LOS was 4 (2–8) days, mean 6.2 days, with 46% (5,496) staying 0–3 days, 29% (3528) staying 4–7 days, 16% (1928) staying 8–14 days, and 9% (1080) staying 15 or more days.

Section 4.1: General length of stay

4.1a Length of stay: historical comparison

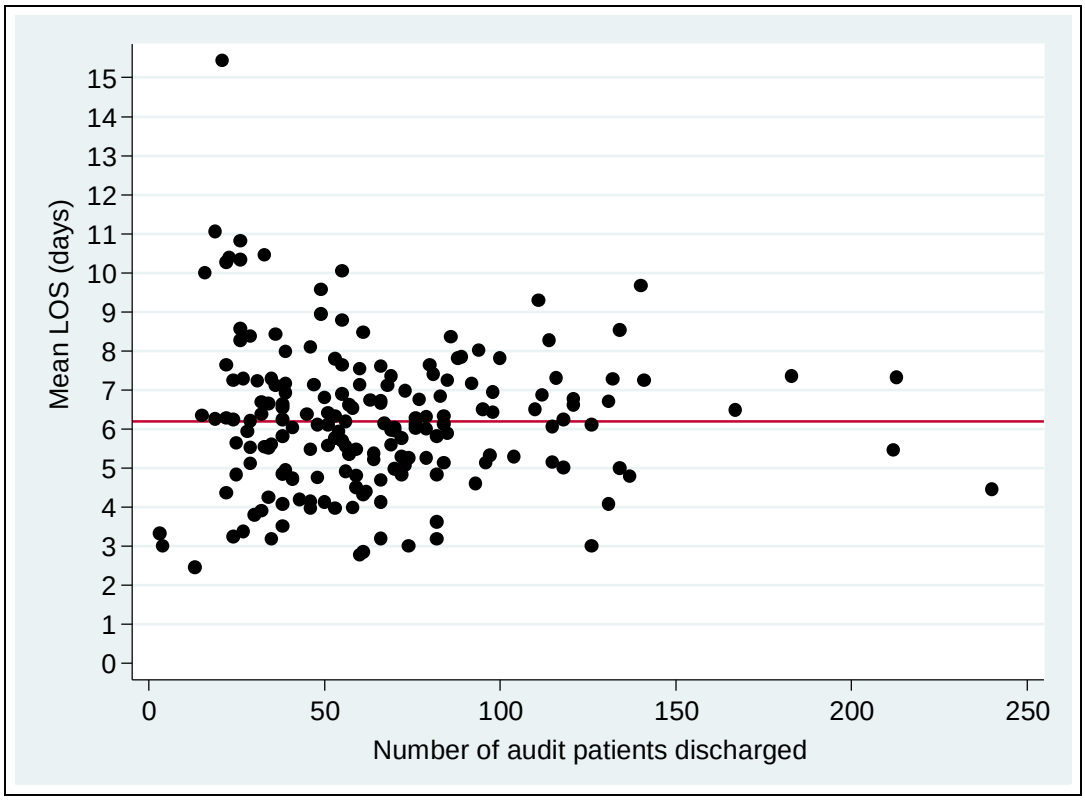
For England from the 2008 audit, the median (IQR) LOS was 5 (3–10) days, mean 8.8 days, with 35% (2513) staying 0–3 days, 30% (2192) staying 4–7 days, 20% (1472) staying 8–14 days, and 15% (1057) staying 15 or more days.

For England from the 2003 audit, the median (IQR) LOS was 6 (3–11) days, mean 8.8 days, with 26% (1469) staying 0–3 days, 33% (1846) staying 4–7 days, 25% (1382) staying 8–14 days, and 16% (919) staying 15 or more days.

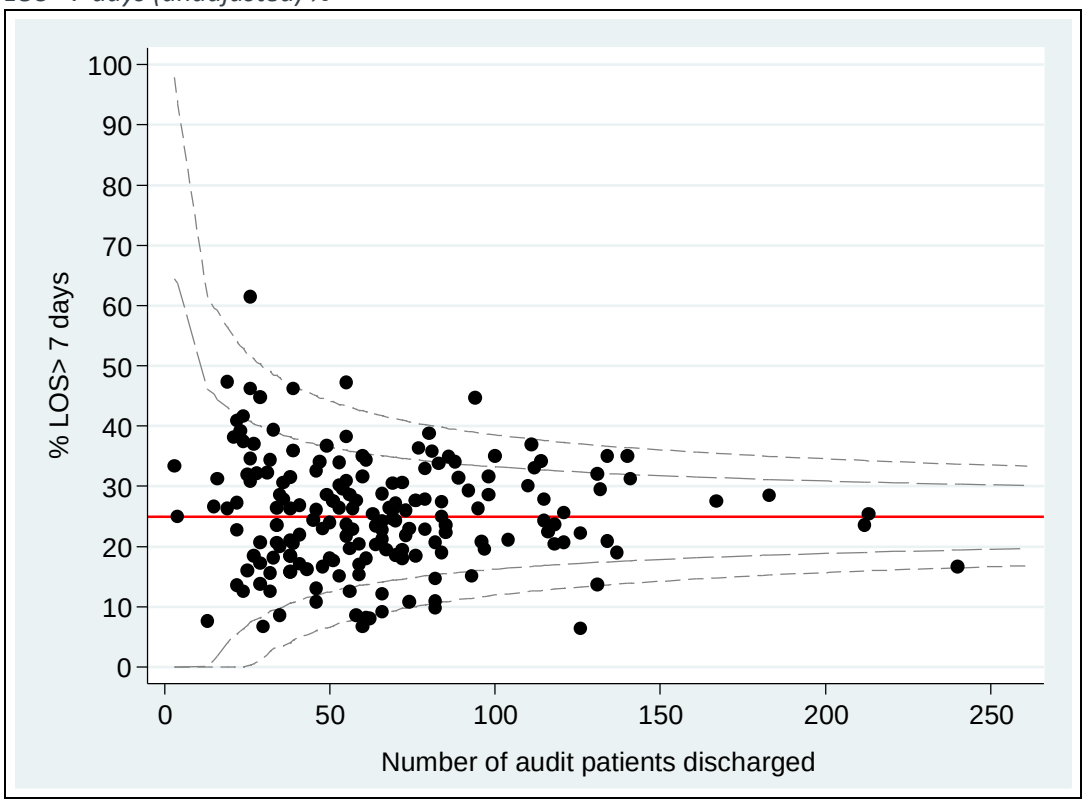
4.1b Length of stay: scatter plot by unit

The three graphics in the segment below demonstrate mean LOS for patients discharged from each unit, an unadjusted plot of percentage of patients discharged following a LOS greater than 7 days and a plot of the same after adjustment for initial pH value and age group. Note the significant unit-to-unit variation.

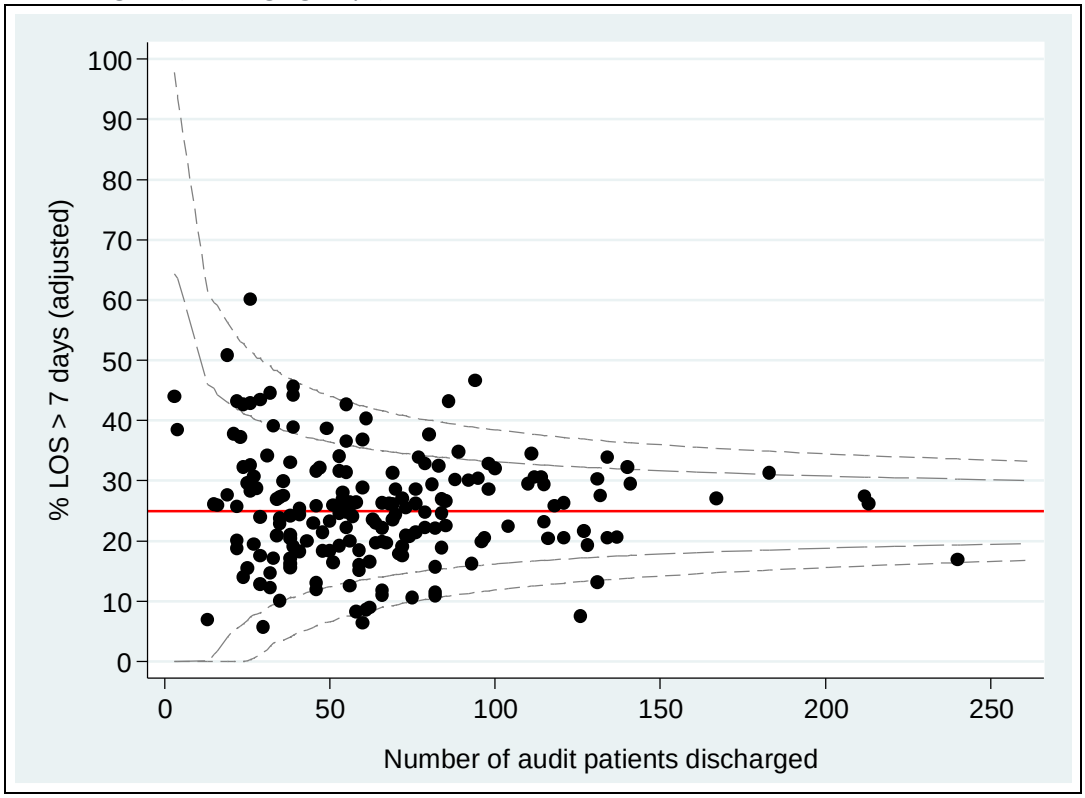
Mean LOS



LOS >7 days (unadjusted) %



LOS >7 days (adjusted) % after adjustment in logistic regression for initial pH value (<7.26, 7.26–7.34, ≥7.35, no blood gases) and age group (<55, 55–64, 65–69, 70–74, 75–79, 80–84, ≥85)



4.1c Length of stay: length of stay in hospital by day of admission, for patients who were discharged

The table below shows LOS according to day of the week of admission. Note that the longest median stay was for patients admitted on a Wednesday or Thursday.

Day of week of admission	Median (IQR) LOS	Mean LOS	LOS >7 days	
Monday	4 (2–8)	6.0	28%	577/2083
Tuesday	3 (2–8)	6.1	25%	470/1860
Wednesday	5 (2–8)	6.2	25%	420/1670
Thursday	5 (2–7)	6.4	25%	407/1648
Friday	4 (2–7)	6.5	22%	345/1543
Saturday	4 (2–7)	6.4	23%	362/1541
Sunday	4 (2–8)	5.7	25%	427/1687
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between days of admission: P<0.001
LOS >7 days: Chi-squared test between days of admission: P=0.01

4.1d Length of stay: by day of discharge

The table below shows LOS according to day of discharge. Note the low LOS for those patients discharged on Saturday and particularly Sunday.

Day of week of discharge	Median (IQR) LOS	Mean LOS	LOS >7 days	
Monday	4 (2–7)	6.3	25%	486/1964
Tuesday	4 (2–8)	6.5	28%	630/2238
Wednesday	4 (2–8)	6.1	26%	526/2028
Thursday	4 (2–8)	6.4	26%	525/2054
Friday	4 (2–8)	6.4	27%	603/2216
Saturday	3 (1–6)	5.7	19%	166/878
Sunday	2 (1–40	4.3	11%	72/654
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between days of discharge: P<0.001
LOS>7 days: Chi-squared test between days of discharge: P<0.001

Section 4.2: Length of stay by variable

4.2a Length of stay: by age

The table below shows length of stay increased according to age.

Age in years	Median (IQR) LOS	Mean LOS	LOS >7 days	
<55	3 (1–6)	4.4	16%	127/801
55–64	4 (2–7)	5.5	21%	457/2150
65–69	4 (2–7)	6.0	23%	450/1915
70–74	4 (2–8)	6.4	26%	546/2122
75–79	4 (2–8)	6.3	26%	529/2044
80–84	4 (2–8)	6.8	28%	462/1622
≥85	5 (2–9)	7.4	32%	437/1377
Total	**4 (2-8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between age groups: P<0.001
LOS >7 days: Chi-squared test between age groups: P<0.001

4.2b Length of stay: by deprivation

The table below relates LOS stay to IMD deprivation quintiles. There was no relationship between deprivation and LOS.

National IMD quintile	Median (IQR) LOS	Mean LOS	LOS >7 days	
Q1 (most deprived)	4 (2–7)	6.1	24%	914/3861
Q2	4 (2–7)	6.1	25%	686/2785
Q3	4 (2–7)	6.0	25%	537/2158
Q4	4 (2–8)	6.6	27%	474/1729
Q5 (least deprived)	4 (2–8)	6.8	28%	329/1194
Not known	4 (2–7)	5.8	22%	68/305
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between days of admission: P<0.001
LOS >7 days: Chi-squared test between days of admission: P=0.01

4.2c Length of stay: according to comorbidities

The two tables in the segment below relate length of stay to various comorbidities. Note the influence of increasing numbers of comorbidities on length of stay.

	Median (IQR) LOS	Mean LOS	LOS >7 days	
Overall	4 (2–8)	6.2	25%	3008/12032
In patients with:				
Alcohol-related condition	4 (2–7)	6.1	24%	102/422
Atrial fibrillation	4 (2–8)***	6.9	30%***	407/1372
Cor pulmonale	7 (3–11)***	9.6	42%***	161/379
Dementia/confusion	5 (2–9)**	7.7	31%**	155/494
Diabetes	4 (2–8)***	6.8	28%***	536/1899
Hearing impairment	5 (2–10)*	8.6	35%*	38/109
Hypertension	4 (2–8)	6.4	27%**	1007/3792
Ischaemic heart disease (IHD)	4 (2–8)	6.3	27%*	664/2486
Kidney disease	4 (2–8)***	6.9	28%	225/808
Left heart failure (LVF)	5 (2–9)***	7.6	32%***	231/728
Locomotor problems	4 (2–8)	6.3	26%	358/1386
Lung cancer	4 (2–8)*	6.5	27%	78/290
Mental health disorder	4 (2–8)	6.4	26%	343/1320
Neurological condition	5 (2–8)**	7.0	29%*	187/646
Osteoporosis	5 (2–9)***	7.4	31%***	257/827
Stroke	4 (2–8)*	6.7	29%*	227/791
Thromboembolic disease (pulmonary embolism (PE), deep-vein thrombosis (DVT))	4 (2–8)*	6.9	29%*	148/510
Visual impairment	5 (2–9)**	7.3	31%*	92/299
Other respiratory disease	4 (2–8)***	6.4	28%*	441/1599
Other cardiovascular disease	4 (2–8)**	6.7	27%	360/1327
Other endocrine disorder	4 (2–8)*	6.8	27%	216/799
Other gastrointestinal condition	4 (2–7)	6.0	25%	342/1375
Other malignant disease	4 (2–7)	6.3	25%	231/927
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

***P<0.001, *0.001≤P<0.01, *0.01≤P<0.05
LOS (days): Mann–Whitney test for presence v absence of specified condition
LOS >7 days: Fisher's exact test for presence v absence of specified condition

Number of comorbidities	Median (IQR) LOS	Mean LOS	LOS >7 days	
None	3 (2–6)	5.1	19%	305/1612
One	4 (2–7)	5.7	22%	697/3231
Two	4 (2–8)	6.3	26%	816/3155
Three	4 (2–8)	6.8	29%	629/2185
Four or more	5 (2–9)	7.1	30%	561/1849
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between days of admission: P<0.001
LOS >7 days: Chi-squared test between days of admission: P<0.001

4.2d Length of stay: by chest X-ray consolidation v no consolidation

Patients with evidence of chest X-ray consolidation had a longer LOS.

Chest X-ray consolidation	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes	5 (3–9)	7.3	31%	633/2041
No	4 (2–7)	6.0	24%	2136/8972
Not known from X-ray	4 (2–8)	6.9	28%	165/583
No X-ray	3 (1–6)	4.8	17%	74/436
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Mann–Whitney test (Yes v No): P<0.001
LOS>7 days: Fisher's exact test (Yes v No): P<0.001

4.2e Length of stay: according to whether seen/not seen by respiratory

The two tables in the segment below show LOS for patients seen by the respiratory team. Note that the respiratory team tended to see those patients with longer LOS.

Seen by a Respiratory Consultant during admission	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes	5 (3–9)	7.5	33%	2195/6638
No	2 (1–5)	4.4	14%	731/5047
Not recorded	3 (2–7)	6.4	24%	82/347
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Mann–Whitney test (Yes v No): P<0.001
LOS >7 days: Fisher's exact test (Yes v No): P<0.001

Seen by a Respiratory Consultant or a respiratory Nurse/member of the COPD/respiratory team during admission	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes	5 (2–8)	6.9	29%	2682/9372
No	2 (1–4)	3.6	12%	273/2371
Not recorded	3 (1–6)	4.9	18%	53/289
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Mann–Whitney test (Yes v No): P<0.001
LOS>7 days: Fisher's exact test (Yes v No): P<0.001

4.2f Length of stay: by MRC score, where available

The table below relates LOS to MRC breathlessness score. Note that patients with higher MRC scores had longer LOS.

MRC grade	Median (IQR) LOS	Mean LOS	LOS >7 days	
Grade 1 – not troubled by breathlessness except on strenuous exercise	3 (1–5)	4.1	12%	37/320
Grade 2 – short of breath when hurrying or walking up a slight hill	3 (1–6)	4.7	18%	118/658
Grade 3 – walks slower than contemporaries on level ground because of breathlessness or has to stop for breath	3 (2–6)	5.2	19%	243/1287
Grade 4 – stops for breath after walking about 100 metres (109 yards) or after a few minutes on level ground	4 (2–7)	5.9	24%	611/2571
Grade 5 – too breathless to leave the house or breathless when dressing or undressing	5 (3–10)	8.0	36%	880/2474
Not known	4 (2–7)	6.0	24%	1119/4722
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known grades: P<0.001
LOS >7 days: Chi-squared test between known grades: P<0.001

4.2g Length of stay: by % predicted FEV_1 where available and GOLD stage, where available

The table below relates LOS to disease severity according to % predicted FEV_1 or GOLD stage. Note the longer LOS for patients with more severe disease.

GOLD stage	Median (IQR) LOS	Mean LOS	LOS >7 days	
Stage I: Mild, ≥80% predicted FEV_1	3 (1–6)	5.0	18%	49/277
Stage II: Moderate, 50–79% predicted FEV_1	4 (2–7)	5.4	21%	307/1429
Stage III: Severe, 30–49% predicted FEV_1	4 (2–8)	6.3	27%	562/2118
Stage IV: Very severe, <30% predicted FEV_1	5 (2–9)	7.4	33%	407/1247
Not known	4 (2–7)	6.2	24%	1683/6961
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known stages: P<0.001
LOS>7 days: Chi-squared test between known stages: P<0.001

4.2h Length of stay: by DECAF score, where available

Although it was not a specific audit question, we were able to calculate a modified DECAF score (DECAF is proposed as a risk assessment tool, but not introduced universally as yet) from information provided on some patients. Note that, although numbers known are smaller, higher DECAF scores are associated with longer LOS.

Modified DECAF score	Median (IQR) LOS	Mean LOS	LOS >7 days	
0	3 (1–6)	4.7	16%	220/1343
1	4 (2–8)	6.3	27%	550/2044
2	5 (3–9)	8.2	35%	403/1154
3	7 (4–12)	9.5	46%	164/357
4	8 (6–15)	12.5	59%	33/56
5	15 (na)	15.0	100%	2/2
Not known	4 (2–7)	5.9	23%	1636/7076
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

na, not applicable
LOS (days): Kruskal–Wallis test between scores (0, 1, 2, 3, 4–5): P<0.001
LOS >7 days: Chi-squared test between scores (0, 1, 2, 3, 4–5): P<0.001

4.2i Length of stay: by initial pH

There was a clear relationship between worsening acidosis on initial pH and longer LOS.

Initial pH	Median (IQR) LOS	Mean LOS	LOS >7 days	
<7.26	7 (4–12)	9.4	47%	232/497
7.26–7.34	6 (3–10)	8.2	37%	512/1390
≥7.35	4 (2–7)	6.2	25%	1796/7251
Not known	3 (1–5)	4.8	16%	468/2894
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known categories: P<0.001
LOS >7 days: Chi-squared test between known categories: P<0.001

4.2j Length of stay: by second pH, where available

There was a clear relationship between worsening acidosis on the second pH, where available, and longer LOS.

Second pH	Median (IQR) LOS	Mean LOS	LOS >7 days	
<7.26	9 (5–14)	11.4	58%	204/352
7.26–7.34	7 (4–11)	9.6	45%	441/978
≥7.35	6 (3–10)	8.1	36%	861/2378
Total	**6 (3–11)**	**8.8**	**41%**	**1506/3708**

LOS (days): Kruskal–Wallis test between categories: P<0.001
LOS >7 days: Chi-squared test between categories: P<0.001

4.2k Length of stay: by whether NIV received/not received

Patients receiving NIV, and those declining it, had a much longer LOS.

Treated with NIV	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes	8 (5–14)	11.0	55%	684/1250
No – not clinically indicated	3 (2–7)	5.6	21%	2164/10277
No – patient declined	6 (3–9)	7.5	37%	25/68
No – NIV not available	4 (3–7)	6.2	22%	5/23
No – reason unclear	5 (3–9)	7.1	30%	83/273
Patient intubated directly	10 (7–22)	13.9	67%	14/21
Not known	4 (2–8)	6.3	28%	33/120
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known categories: P<0.001
LOS >7 days: Chi-squared test between known categories: P<0.001

4.2l Length of stay: by time to NIV

The table below relates LOS to the time to NIV, where known, for patients receiving this treatment. Note that LOS was much greater in the group of patients who received NIV more than 24 hours after they were admitted. Timings for when NIV was given were known for 920 of the 1250 patients treated with NIV.

Time to NIV	Median (IQR) LOS	Mean LOS	LOS >7 days	
Treated before admission:				
≥12 but <24 hours	7 (na)	8.3	33%	2/6
<12 hours	8 (6–12)	10.9	52%	39/75
Treated after admission:				
< 30 minutes	8 (5–13)	10.2	56%	30/54
30–59 minutes	7 (5–11)	9.4	41%	30/73
60–179 minutes	8 (5–12)	10.3	52%	110/210
3–24 hours	7 (5–11)	9.6	50%	184/369
>24 hours	14 (8–20)	17.3	82%	109/133

na, not applicable

4.2m Length of stay: by whose care patient under when discharged

The table below indicates that patients under the care of acute physicians had a much shorter LOS than those under the care of other specialities.

Under whose care when decision to discharge or transfer to early discharge scheme (multiples possible)	Median (IQR) LOS	Mean LOS	LOS >7 days	
Acute Medicine Consultant	2 (1–4)***	3.9	11%***	439/3899
Respiratory Consultant	5 (3–9)***	7.4	33%***	1989/6070
Care of the Elderly Consultant	5 (2–9)***	7.5	32%***	384/1212
GP	2 (1–5)	3.8	15%	7/46
Other	5 (3–7)	6.6	25%	143/579
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

***P<0.001, **0.001≤P<0.01, *0.01≤P<0.05
LOS (days): Mann–Whitney test for presence v absence of specified consultant
LOS >7 days: Fisher's exact test for presence v absence of specified consultant

4.2n Length of stay: by whether discharged under the care of a COPD team or early/supported discharge service or equivalent

The table below indicates that patients accepted onto early/supported discharge services had shorter LOS. This has now been shown over sequential audits.

Evidence that patient was discharged under the care of a COPD team/early supported discharge service or equivalent	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes	4 (2–7)	5.8	23%	1132/4911
Reviewed by early discharge scheme but not accepted	5 (3–9)	7.7	32%	329/1042
Not suitable for referral to early discharge scheme	6 (3–11)	8.7	38%	520/1352
Not recorded	3 (1–7)	5.5	21%	673/3147
Not available	4 (2–7)	5.7	22%	354/1580
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between categories: P<0.001
LOS >7 days: Chi-squared test between categories: P<0.001

4.2o Length of stay: by venue of discharge

The tables in the segment below relate LOS to venue of discharge, splitting the data by age as well. Note that patients discharged to community hospitals / rehabilitation wards had a much longer LOS than those discharged to other venues. A longer LOS was also noted for those discharged to residential placement. These longer LOSs are seen in patients of all age groups who are discharged to community hospitals or residential care.

Patient was discharged to:	Median (IQR) LOS	Mean LOS	LOS >7 days	
Community hospital / rehabilitation ward or equivalent	9 (4–19)	12.8	57%	120/212
Residential placement	6 (3–11)	9.4	39%	204/524
Sheltered accommodation	4 (2–7)	6.2	24%	60/252
House/flat alone	4 (2–8)	6.2	25%	929/3688
House/flat with another person	4 (2–7)	5.6	23%	1397/6096
Other	3 (1–6)	5.9	19%	35/183
Not known	4 (2–7)	6.3	24%	263/1077
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known categories: P<0.001
LOS >7 days: Chi-squared test between known categories: P<0.001

4.2p Length of stay: by age

Where age <65

Patient was discharged to	Median (IQR) LOS	Mean LOS	LOS >7 days	
Community hospital / rehabilitation ward or equivalent	7 (3–12)	10.1	48%	13/27
Residential placement	3 (2–6)	6.0	20%	8/40
Sheltered accommodation	2 (1–7)	4.8	23%	8/35
House/flat alone	4 (2–7)	5.4	20%	168/833
House/flat with another person	3 (1–7)	5.1	20%	325/1660
Other	2 (1–6)	5.3	12%	7/57
Not known	3 (2–6)	5.0	18%	55/299
Total	**3 (2–7)**	**5.2**	**20%**	**584/2951**

Where age 65–74

Patient was discharged to	Median (IQR) LOS	Mean LOS	LOS >7 days	
Community hospital / rehabilitation ward or equivalent	9 (5–20)	13.6	57%	33/58
Residential placement	6 (4–14)	10.7	44%	45/103
Sheltered accommodation	5 (3–8)	6.4	26%	21/82
House/flat alone	4 (2–8)	6.3	26%	305/1195
House/flat with another person	4 (2–7)	5.7	22%	490/2180
Other	3 (1–5)	5.4	21%	14/66
Not known	4 (2–7)	6.3	25%	88/353
Total	**4 (2–7)**	**6.2**	**25%**	**996/4037**

Where age ≥75

Patient was discharged to	Median (IQR) LOS	Mean LOS	LOS >7 days	
Community hospital / rehabilitation ward or equivalent	10 (5–19)	13.0	58%	74/127
Residential placement	6 (3–11)	9.4	40%	151/381
Sheltered accommodation	4 (2–7)	6.5	23%	31/135
House/flat alone	4 (2–8)	6.6	27%	456/1660
House/flat with another person	4 (2–8)	6.0	26%	582/2255
Other	3 (1–7)	7.1	23%	14/60
Not known	4 (2–8)	6.2	28%	120/425
Total	**4 (2–8)**	**6.7**	**28%**	**1428/5043**

4.2q Length of stay: by suitability for/whether assessed for PR

Patients deemed not suitable for pulmonary rehabilitation had a longer LOS.

Was suitability for PR considered at the time of discharge	Median (IQR) LOS	Mean LOS	LOS >7 days	
Yes – assessed and referred	4 (2–7)	5.7	23%	426/1829
Yes – assessed but referral declined	4 (2–7)	5.9	22%	252/1122
Yes – assessed but not suitable for referral	5 (3–10)	8.3	36%	747/2066
No assessment made	3 (1–7)	5.5	21%	1083/5149
Other	3 (2–6)	5.4	19%	52/276
Not known	4 (2–8)	6.5	28%	448/1590
Total	**4 (2–8)**	**6.2**	**25%**	**3008/12032**

LOS (days): Kruskal–Wallis test between known categories: P<0.001
LOS >7 days: Chi-squared test between known categories: P<0.001

Section 5: Readmissions 30/90 days after index discharge

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Key findings/observations

- **One-quarter (24%)** of the patients were **readmitted at least once** for any reason within 30 days of discharge.
- **Nearly half (43%)** of the patients were **readmitted at least once** for any reason within 90 days of discharge.
- **Twelve percent** of the patients were readmitted at least once **owing to COPD** within 30 days of discharge
- **Twenty-three percent** of the patients were readmitted at least once **owing to COPD** within 90 days of discharge.
- Although **COPD** was the **commonest reason** for readmission, it accounted for fewer than half of all the readmissions within 30 (44%) and 90 (43%) days of discharge.
- While 5% of patients had two or more admissions within 30 days following discharge, one-fifth (18%) had two or more admissions within 90 days of discharge.
- There was **wide variation** in readmission rates between units.
- All-cause, respiratory and COPD readmission rates **increased with IMD deprivation**, in contrast to mortality within 30/90 days, which showed no relationship with deprivation. Subtraction of COPD readmission rates from all-cause readmission rates indicated no trend with IMD for patients who only had non-COPD readmissions.
- Readmission rates within 30/90 days were associated with **increasing age**, although the relationship was stronger for all-cause rather than respiratory or COPD-related readmissions.
- Readmission rates, particularly all-cause, **increased by length of stay** category (0–3, 4–7, 8–14, 15+ days).
- Readmission rates within 30/90 days were **higher for those with one or more comorbidity** noted on admission, notably so for non-COPD-coded readmissions. Multiple comorbidities did not impact substantially upon the 30-day rate of COPD-coded readmissions.
- Higher readmission rates within 30/90 days were associated with:
    - increasing **MRC score** (especially for COPD readmissions and patients having respiratory non-COPD readmissions, but less so for those only with non-respiratory readmissions)
    - increasing **GOLD stage** (especially for COPD readmissions, but not seen for those only having non-COPD readmissions)
    - increasing **DECAF score** (seen for patients with non-COPD respiratory readmissions)
    - decreasing **initial pH** (seen for patients with COPD readmissions and patients having other non-COPD respiratory admissions, but not for those only having non-respiratory readmissions). No associations were seen with second pH.
- **Higher** readmission rates were seen in patients who received **NIV** during the index admission, particularly within 30 days and notably for those with COPD readmissions (17%/29% for COPD readmissions within 30/90 days, 29%/48% all-cause readmissions).
- **Higher** readmission rates were also seen in those **declining NIV** (29%/43% COPD readmissions within 30/90 days, and 39%/54% all-cause readmissions).
- Readmission rates within 30 and 90 days were **lower** for patients who had a Do Not Resuscitate (DNR) order that stipulated for 'full escalation'.
- Readmission rates within 30/90 days were **higher** for those patients managed on a medical or respiratory HDU during their index admission.
- Readmission rates within 30/90 days were **higher** for those discharged under the care of Respiratory Consultants compared with Acute Physicians or Care of the Elderly Consultants.
- Readmission rates, more so all-cause but also COPD-related, within 30 and 90 days were lower in patients taken home by a COPD team or early supported discharge service or equivalent, compared with those not accepted or unsuited.

- All-cause readmission rates within 30 and 90 days were much **higher** for patients discharged to community hospitals / rehabilitation wards or equivalent, and particularly so for those discharged to sheltered accommodation. Respiratory and COPD-related readmission rates were also **higher** for those discharged to sheltered accommodation.
- Direct historical comparison of readmission rates is difficult and inadvisable because the definition of readmission has changed over sequential audits.

Suggested areas for improvement

- Hospital teams should look carefully at their **discharge processes** and how they mitigate against readmission.
- Hospital teams should ensure that **comorbidities** are managed and that patients are signposted to evidence-based services known to reduce readmissions.
- Primary care teams should devote resource to **identifying, reviewing and enhancing the management** of those COPD patients on their lists who are deemed at particular risk of hospital admission.

Navigation

This section contains the following tables. If viewing this report on a computer, you can select the chart that you wish to go to by selecting it from the list below.

Within 90 days following the discharge date of the index admission (according to audit data), the HES data were scrutinised to calculate the number of days to each readmission, as well as noting the primary reason

(diagnosis code 1) for the readmission. From this information, the number of readmissions within 30 days and within 90 days was computed for each audit patient. In the section on LOS, it was noted that, in a minority of cases, an exact agreement between audit and HES index admission dates could not be found. This presented a difficulty of having to decide whether close matching HES data represented the same admission or possibly a different readmission or preadmission. Decision rules were applied to when the HES admission date(s) closely matched within ±2 days of the audit admission date; when the mismatch was greater, then the assumption was that the audit admission had been missed by HES and any HES record within appropriate timelines was countable towards readmissions or preadmissions. For further detail on such rulings see Appendix B of the supplementary report (*COPD: Who cares when it matters most?*).

Section 5.1: General readmission within 30/90 days

5.1a Number of patients with readmissions within 30 and 90 days of index audit discharge date

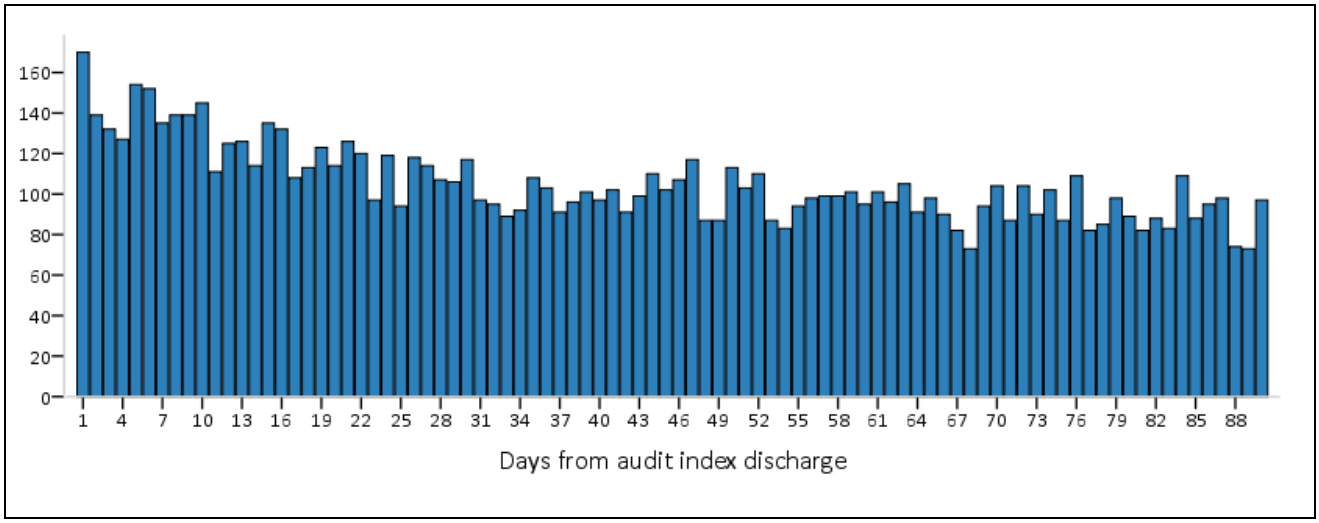
The table below represents the number of all-cause readmissions within 30 and 90 days of being discharged. One-quarter (24%, 2931/12054) of audit patients were readmitted within 30 days of being discharged, 95% confidence interval 23–25%; 43% (5196/12054) were readmitted within 90 days, 95% confidence interval 42–44%. The median (IQR) time to first readmission was 12 (6–20) days for those readmitted within 30 days, and 26 (10–51) days for those first readmitted at any time within 90 days.

Number of readmissions within 30 days of audit index discharge			Number of readmissions within 90 days of audit index discharge		
None	9123	(76%)	None	6858	(57%)
One	2324	(19%)	One	2969	(25%)
Two	497	(4%)	Two	1255	(10%)
Three or more	110	(1%)	Three	552	(5%)
			Four or more	420	(3%)
Total	**12054**	**(100%)**		**12054**	**(100%)**

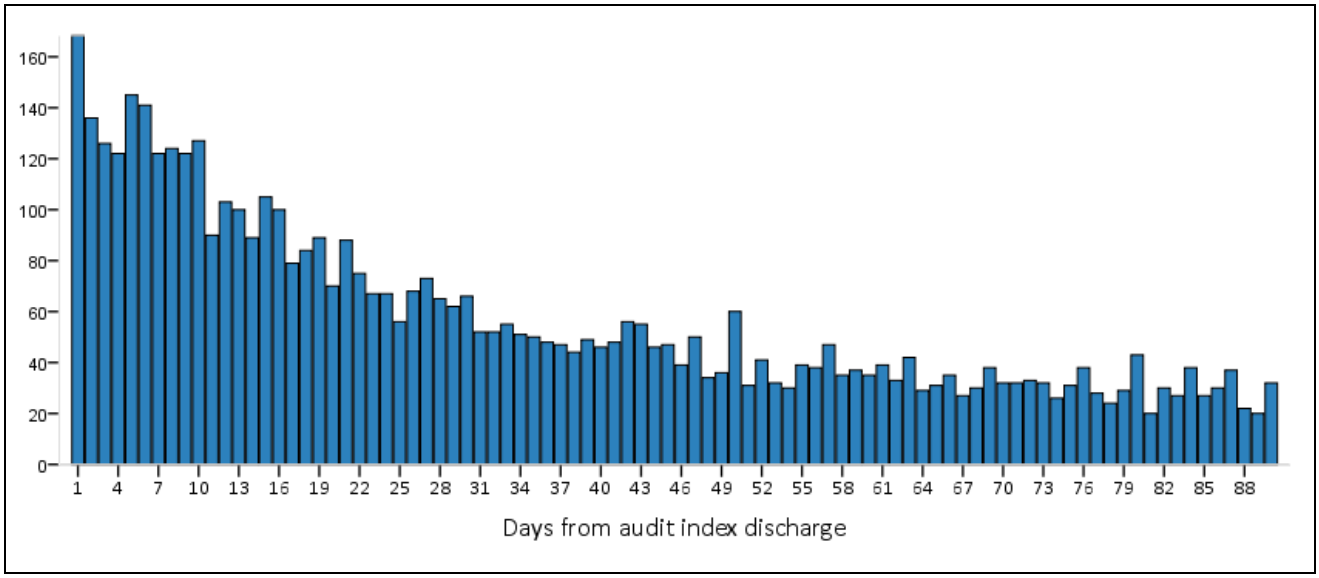
Percentage of all discharged patients who had one or more readmission, by reason			
Within 30 days of the audit index discharge		**Within 90 days of the audit index discharge**	
All-cause	24%	All-cause	43%
Respiratory	17%	Respiratory	30%
COPD	12%	COPD	23%

The graphs below represent the spread of readmissions by the number of days from being discharged. The first graph shows all readmissions; the second shows the number of days from discharge to the first or only readmission.

All readmissions by number of days from audit index discharge



First (or only) readmission by number of days from audit index discharge



5.1b Reasons for all readmissions within 30 and 90 days of index audit discharge date

The tables below show the reasons for all readmissions within 30 days and 90 days of the index audit discharge date. They consider also the relationship between the first and second readmissions. COPD remained the most common reason for all readmissions, although it accounted for less than half of the total. Patients who had a first readmission with COPD were much more likely to have second readmission with COPD.

Reasons for all readmissions within 30 days of index audit discharge

Reason (primary diagnosis)	First readmission		Second readmission		Third readmission		Fourth readmission		Subsequent readmissions		All readmissions	
COPD (J44.0, J44.1, J44.8, J44.9)	46%	1356	42%	256	36%	40	21%	6	7%	5	44%	1663
Pneumonia (J18.0, J18.1, J18.9)	14%	406	12%	74	10%	11	3%	1	0%	0	13%	492
Other respiratory (all other J codes)	7%	206	6%	37	7%	8	14%	4	0%	0	7%	255
Circulatory (I00–I99)	6%	177	7%	43	8%	9	3%	1	0%	0	6%	230
Other	27%	786	32%	197	38%	42	59%	17	93%	69	30%	1111
Total		**2931**		**607**		**110**		**29**		**74**		**3751**

Relationship between reasons for first and second readmission within 30 days of index audit discharge

First readmission	Second readmission					Total
	COPD (J44.0, J44.1, J44.8, J44.9)	Pneumonia (J18.0, J18.1, J18.9)	Other respiratory (all other J codes)	Cardiovascular (I00–I99)	Other	
COPD (J44.0, J44.1, J44.8, J44.9)	177	33	14	15	58	297
Pneumonia (J18.0, J18.1, J18.9)	23	24	7	2	18	74
Other respiratory (all other J codes)	7	4	9	3	4	27
Circulatory (I00–I99)	7	5	1	18	9	40
Other	42	8	6	5	108	169
Total	**256**	**74**	**37**	**43**	**197**	**607**

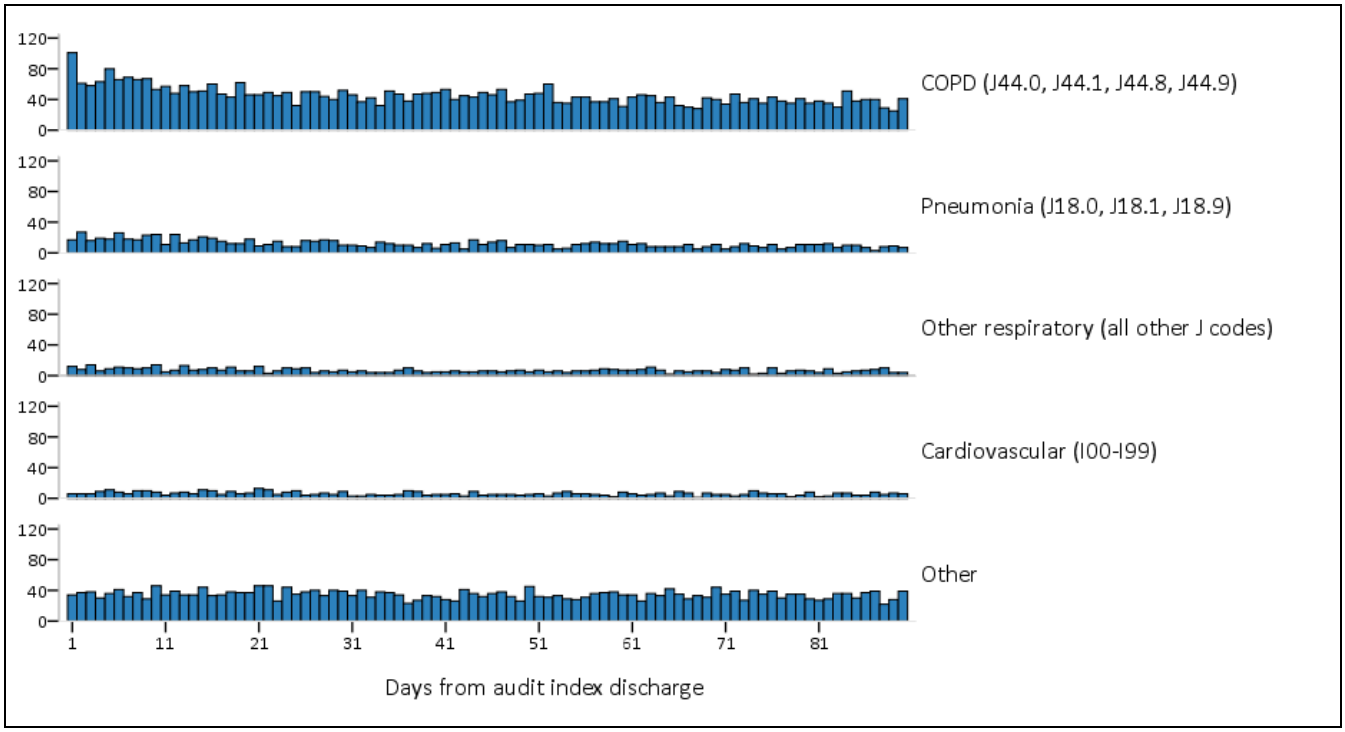
Reasons for all readmissions within 90 days of index audit discharge

Reason (primary diagnosis)	First readmission		Second readmission		Third readmission		Fourth readmission		Subsequent readmissions		All readmissions	
COPD (J44.0, J44.1, J44.8, J44.9)	44%	2302	44%	978	45%	437	48%	202	28%	181	43%	4100
Pneumonia (J18.0, J18.1, J18.9)	13%	650	12%	275	9%	84	10%	43	3%	21	11%	1073
Other respiratory (all other J codes)	7%	354	7%	152	6%	63	5%	23	4%	23	7%	615
Circulatory (I00–I99)	6%	313	7%	146	5%	53	5%	21	3%	19	6%	552
Other	30%	1577	30%	676	34%	335	31%	131	62%	399	33%	3118
Total		**5196**		**2227**		**972**		**420**		**643**		**9458**

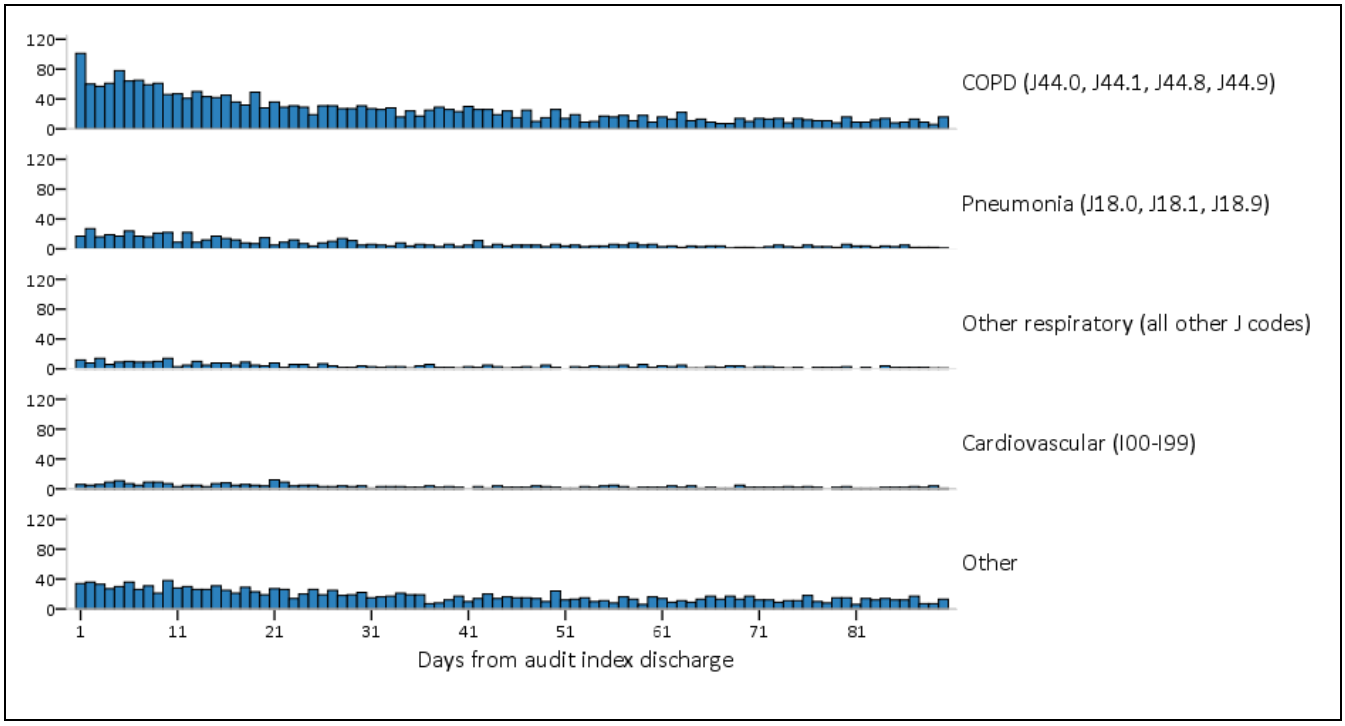
Relationship between reasons for first and second readmission within 90 days of index audit discharge

First readmission	Second readmission					Total
	COPD (J44.0, J44.1, J44.8, J44.9)	Pneumonia (J18.0, J18.1, J18.9)	Other respiratory (all other J codes)	Cardiovascular (I00–I99)	Other	
COPD (J44.0, J44.1, J44.8, J44.9)	638	124	64	45	200	1071
Pneumonia (J18.0, J18.1, J18.9)	99	70	17	13	62	261
Other respiratory (all other J codes)	46	14	40	7	25	132
Circulatory (I00–I99)	30	14	8	40	33	125
Other	165	53	23	41	356	638
Total	**978**	**275**	**152**	**146**	**676**	**2227**

All readmissions by reason by number of days from audit index discharge



First (or only) readmissions by reason by number of days from audit index discharge



5.1c Reasons for readmission: respiratory disease

We examined all respiratory-coded readmissions. 17% (2045/12054) of audit patients were readmitted for respiratory-coded reasons within 30 days of being discharged, and 30% (3661/12054) within 90 days.

Number of patients with respiratory-coded readmissions within 30 and 90 days of index audit discharge

Number of readmissions within 30 days of index audit discharge			Number of readmissions within 90 days of index audit discharge		
None	10009	(83%)	None	8393	(70%)
One	1732	(14%)	One	2360	(20%)
Two	271	(2%)	Two	823	(7%)
Three or more	42	(0.3%)	Three	278	(2%)
			Four or more	200	(2%)
Total	**12054**	**(100%)**	**Total**	**12054**	**(100%)**

5.1d Reasons for readmission: COPD

We examined all COPD-coded readmissions: 12% (1443/12054) of audit patients were readmitted for COPD-coded reasons within 30 days of being discharged, and 23% (2721/12054) within 90 days.

Number of patients with COPD-coded readmissions within 30 and 90 days of index audit discharge

Number of readmissions within 30 days of index audit discharge			Number of readmissions within 90 days of index audit discharge		
None	10611	(88%)	None	9333	(77%)
One	1251	(10%)	One	1873	(16%)
Two	171	(1%)	Two	540	(4%)
Three or more	21	(0.2%)	Three	180	(1%)
			Four or more	128	(1%)
Total	**12054**	**(100%)**	**Total**	**12054**	**(100%)**

5.1e Reasons for readmissions: cardiovascular disease

As cardiovascular disease is a common comorbidity in patients with COPD, we looked specifically at cardiovascular (circulatory) readmissions. 1.7% (205/12054) of audit patients were readmitted for circulatory reasons within 30 days of being discharged, and 3.7% (472/12054) within 90 days.

Number of patients with circulatory readmissions within 30 and 90 days of index audit discharge

Number of readmissions within 30 days of index audit discharge			Number of readmissions within 90 days of index audit discharge		
None	11849	(98.3%)	None	11582	(96.1%)
One	184	(1.5%)	One	412	(3.4%)
Two	18	(0.1%)	Two	50	(0.4%)
Three or more	3	(<0.1%)	Three	8	(0.1%)
			Four or more	2	(<0.1%)
Total	**12054**	**(100%)**	**Total**	**12054**	**(100%)**

5.1f Historical comparison of readmission data

In previous audits, readmission was measured within 90 days of the index admission date and not from discharge. Readmission data were derived from retrieval and review of case records.

The specific question asked of auditors in 2003 and 2008 was 'has the patient been admitted to hospital, or accepted by an early discharge scheme, since this first episode of care?'.

Historical 90-day readmission results for England, obtained by notes review and using the date from index admission, were:

- 2008 audit: 34% (2351/6998)
- 2003 audit: 32% (1636/5084).

For the 2014 audit, HES data were used to determine readmission, with the date of discharge as the reference point, because we wished to capture cases diagnosed during the admission and begin to assess discharge processes more carefully going forwards.

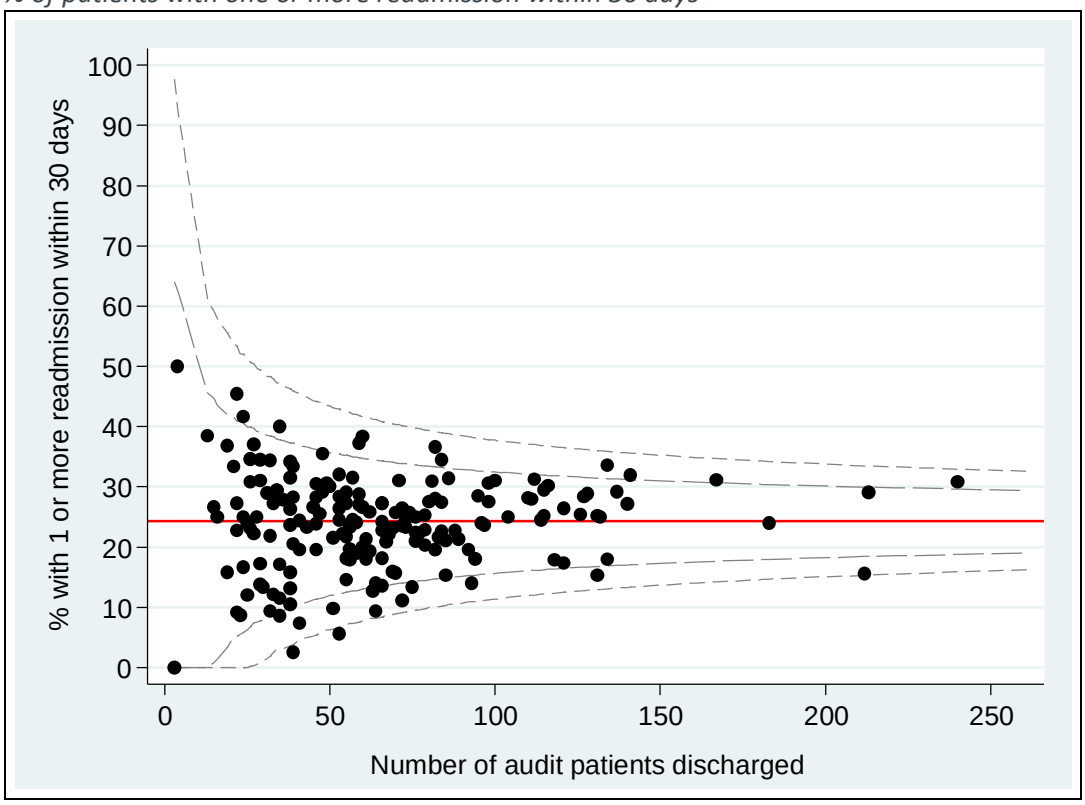
It was, however, possible to calculate the readmission date from the day of admission for 2014: by adding the 2014 audit index LOS to the time in days to readmission from discharge, the time from index admission in days was obtained. 2014 audit readmissions within 90 days of audit index admission were:

- 41% (4,990/12,054) readmitted one or more times for any reason
- 29% (3,509/12,054) readmitted one or more times for respiratory reasons (primary J codes)
- 22% (2,603/12,054) readmitted one or more times for COPD (primary reason codes J44.0, J44.1, J44.8, J44.9).

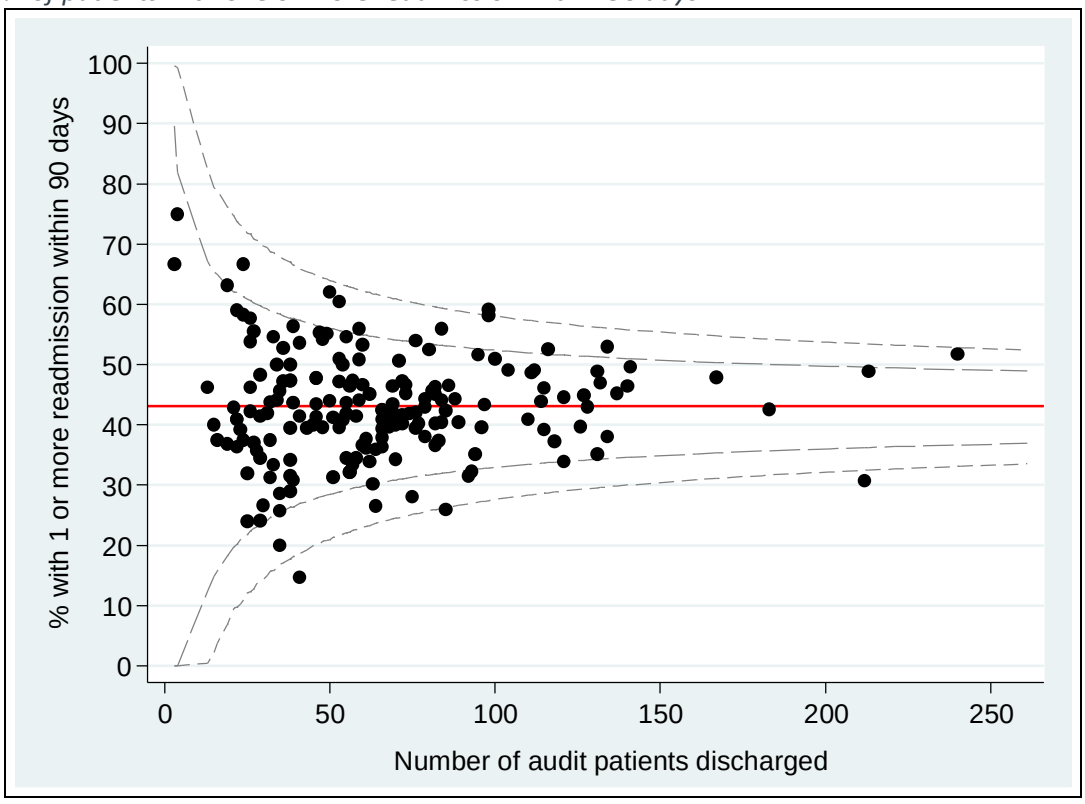
5.1g Readmission: scatter plot by units

Readmission rates (unadjusted) were plotted for each unit, and split into all-cause, respiratory-coded and COPD-coded. This enabled representation by scatter plot of the unit variation of readmission rates relative to audit sample size for each unit. As in previous audits, there was wide variation in readmission rates across units, irrespective of the cause of readmission.

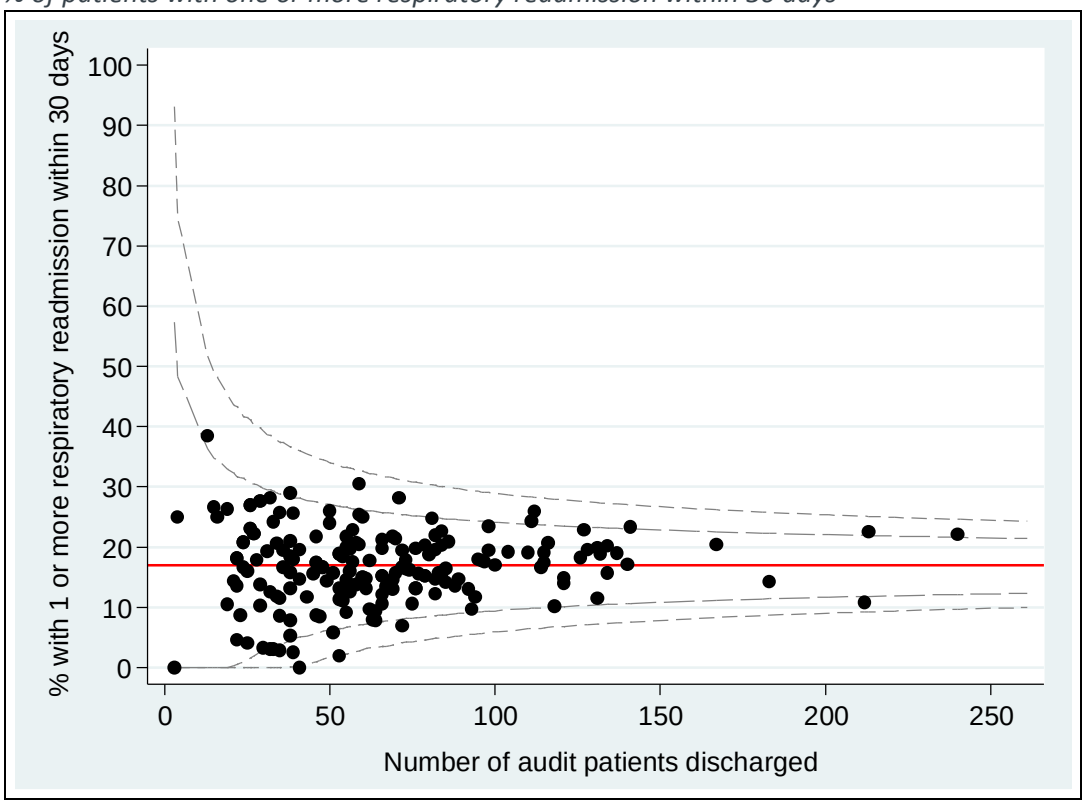
% of patients with one or more readmission within 30 days



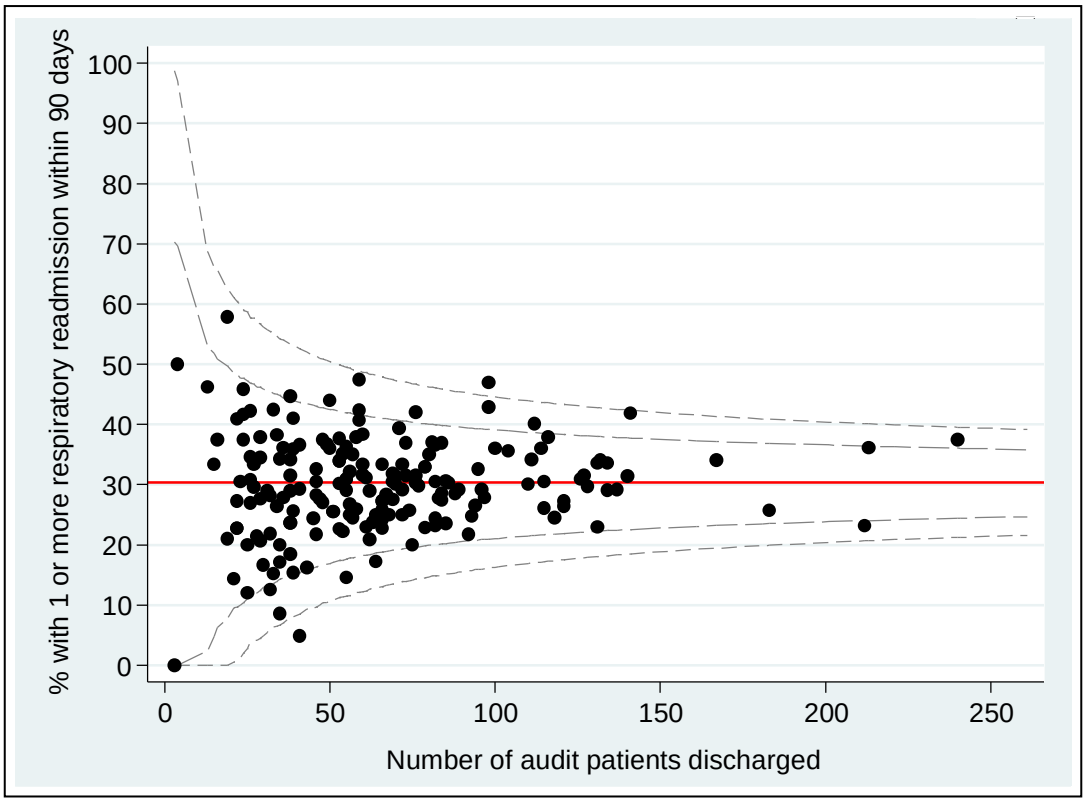
% of patients with one or more readmission within 90 days



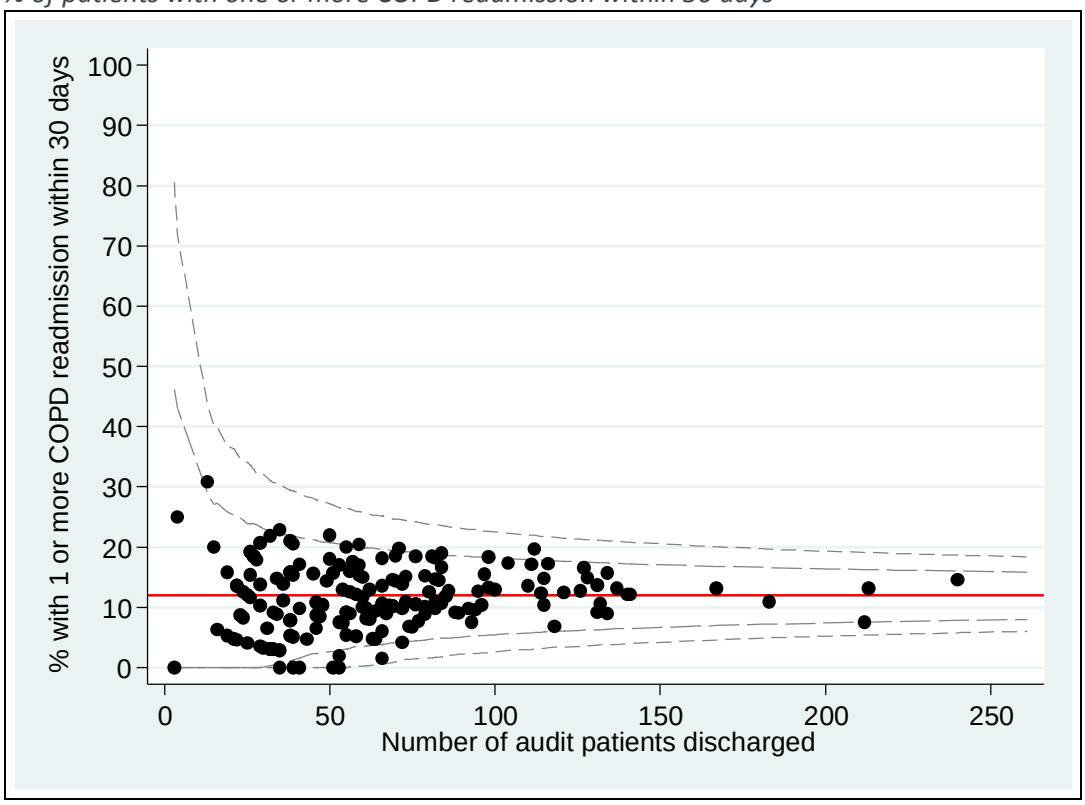
% of patients with one or more respiratory readmission within 30 days



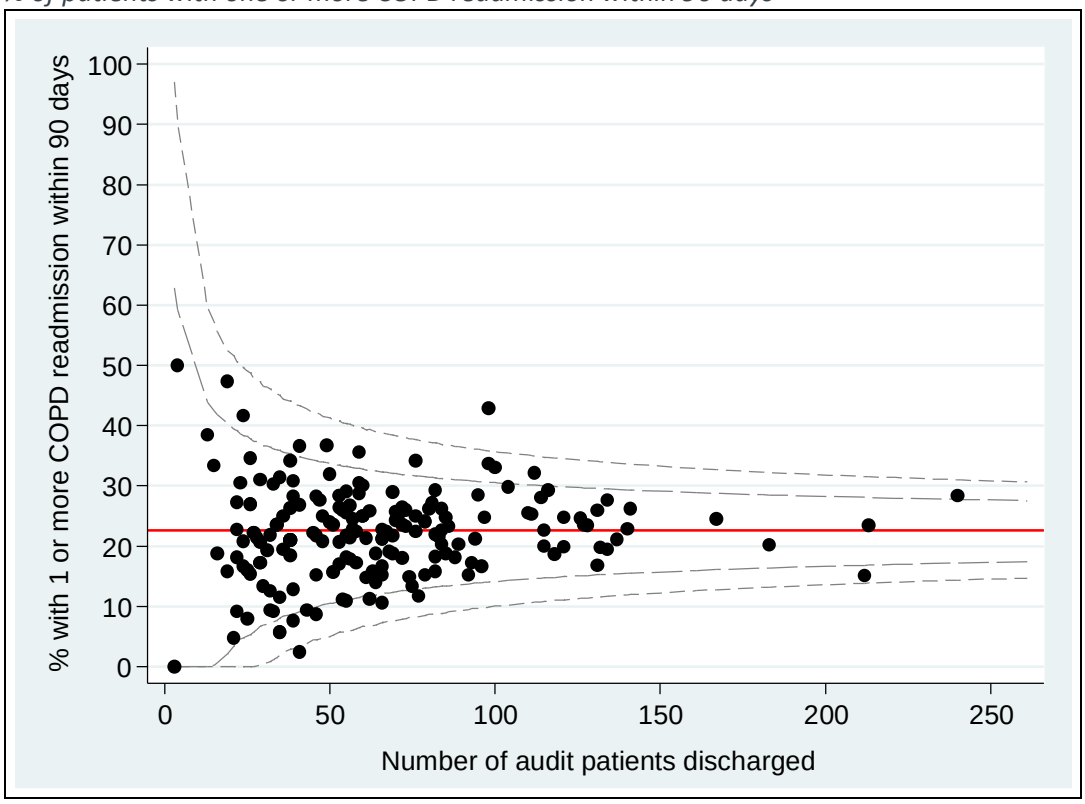
% of patients with one or more respiratory readmission within 90 days



% of patients with one or more COPD readmission within 30 days



% of patients with one or more COPD readmission within 90 days



Section 5.2: readmissions in relation to other factors

5.2a Readmissions: relation to deprivation

The two tables in the segment below relate 30- and 90-day readmissions to deprivation. COPD, but not non-COPD, readmissions seemed related to deprivation.

National IMD quintile	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Q1 (most deprived)	26%	1004/3867	19%	728/3867	13%	518/3867
Q2	24%	679/2787	17%	477/2787	12%	341/2787
Q3	24%	509/2163	16%	346/2163	12%	252/2163
Q4	24%	413/1732	16%	284/1732	11%	194/1732
Q5 (least deprived)	21%	254/1199	14%	163/1199	9%	105/1199
Not known	24%	72/306	15%	47/306	11%	33/306
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: P=0.01, P<0.001 and P<0.001, respectively

National IMD quintile	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Q1 (most deprived)	45%	1732/3867	32%	1254/3867	25%	955/3867
Q2	43%	1206/2787	31%	852/2787	23%	649/2787
Q3	43%	920/2163	29%	637/2163	22%	473/2163
Q4	43%	740/1732	30%	522/1732	21%	361/1732
Q5 (least deprived)	39%	469/1199	26%	306/1199	18%	216/1199
Not known	42%	129/306	29%	90/306	22%	67/306
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: P=0.01, P<0.001 and P<0.001, respectively

5.2b Readmissions: relation to age

The two tables in the segment below relate 30- and 90-day readmissions to age. There was a clear relationship between increasing age and all-cause readmission, although this wasn't obviously apparent for COPD.

Patient age (years)	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
<55	19%	156/802	14%	109/802	10%	81/802
55–64	24%	516/2153	18%	380/2153	13%	290/2153
65–69	22%	429/1917	15%	294/1917	11%	210/1917
70–74	24%	519/2127	17%	364/2127	13%	269/2127
75–79	25%	522/2050	18%	378/2050	13%	271/2050
80–84	27%	432/1624	17%	284/1624	12%	188/1624
≥85	26%	357/1380	17%	236/1380	10%	134/1380
Total	**24%**	**2931/12053**[†]	**17%**	**2045/12054**	**12%**	**1443/12053**[†]

[†]Age for one patient not known. Chi-squared test between known categories: P=0.001, P=0.03 and P=0.003, respectively

Patient age (years)	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
<55	33%	267/802	24%	196/802	19%	154/802
55–64	41%	887/2153	29%	623/2153	23%	503/2153
65–69	40%	769/1917	29%	562/1917	22%	431/1917
70–74	45%	947/2127	32%	674/2127	24%	521/2127
75–79	46%	936/2050	33%	679/2050	24%	500/2050
80–84	46%	751/1624	31%	500/1624	21%	348/1624
≥85	46%	639/1380	31%	427/1380	19%	264/1380
Total	**43%**	**5196/12053**[†]	**30%**	**3661/12053**[†]	**23%**	**2721/12053**[†]

Age for one patient not known. Chi-squared test between known categories: all P<0.001

5.2c Readmissions: relation to length of stay

The two tables in the segment below relate 30- and 90-day readmissions to LOS. There is a clear relationship between increasing LOS and both all-cause and respiratory/COPD-related readmissions.

LOS	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
0–3 days	22%	1236/5496	15%	845/5496	11%	627/5496
4–7 days	23%	820/3528	16%	581/3528	12%	409/3528
8–14 days	29%	562/1928	21%	402/1928	14%	273/1928
15 or more days	28%	305/1080	19%	210/1080	12%	130/1080
Not known	36%	8/22	32%	7/22	18%	4/22
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: P<0.001, P<0.001 and P=0.01, respectively

LOS	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
0–3 days	40%	2195/5496	27%	1510/5496	21%	1169/5496
4–7 days	43%	1520/3528	30%	1062/3528	22%	786/3528
8–14 days	49%	946/1928	37%	714/1928	26%	504/1928
15 or more days	49%	525/1080	34%	367/1080	24%	257/1080
Not known	45%	10/22	36%	8/22	23%	5/22
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: all P<0.001

5.2d Readmissions: relation to chest X-ray consolidation/no consolidation

The two tables in the segment below relate 30- and 90-day readmissions to the presence or absence of consolidation on the index admission chest X-ray. No obvious relationship was seen.

Chest X-ray consolidation	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Yes	25%	511/2045	17%	350/2045	10%	208/2045
No	24%	2183/8985	17%	1541/8985	13%	1130/8985
Not known from X-ray	25%	145/587	16%	92/587	11%	62/587
No X-ray	21%	92/437	14%	62/437	10%	43/437
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Fisher's exact test (Yes v No): P=0.51, P=0.99 and P=0.003, respectively

Chest X-ray consolidation	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Yes	44%	900/2045	31%	634/2045	20%	408/2045
No	43%	3849/8985	30%	2734/8985	23%	2105/8985
Not known from X-ray	45%	265/587	28%	167/587	20%	116/587
No X-ray	42%	182/437	29%	126/437	21%	92/437
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Fisher's exact test (Yes v No: P=0.34, P=0.61 and P=0.001, respectively

5.2e Readmissions: relation to number of comorbidities

The two tables in the segment below relate 30- and 90-day readmissions to the number of comorbidities. There was a clear relationship between increasing comorbidities and all-cause readmissions within 30 and, most notably, 90 days. This appeared less obvious for those readmitted with respiratory disease and COPD.

Number of significant medical conditions	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
None	19%	306/1621	15%	250/1621	11%	184/1621
One	22%	700/3236	16%	513/3236	12%	390/3236
Two	26%	808/3157	18%	554/3157	12%	385/3157
Three	27%	582/2189	18%	392/2189	12%	260/2189
Four or more	29%	535/1851	18%	336/1851	12%	224/1851
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between categories: P<0.001, P=0.05 and P=0.94, respectively

Number of significant medical conditions	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
None	33%	532/1621	26%	416/1621	20%	324/1621
One	39%	1272/3236	29%	934/3236	23%	729/3236
Two	45%	1418/3157	32%	1016/3157	24%	747/3157
Three	48%	1047/2189	32%	698/2189	23%	495/2189
Four or more	50%	927/1851	32%	597/1851	23%	426/1851
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between categories: P<0.001, P<0.001 and P=0.07, respectively

5.2f Readmissions: relation to MRC score, where available

The two tables in the segment below relate 30- and 90-day readmissions to MRC breathlessness grade. There was a clear relationship between increasing MRC score and both 30- and 90-day readmissions, whatever the reason for readmission.

MRC grade	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Grade 1 – not troubled by breathlessness except on strenuous exercise	12%	40/322	7%	22/322	5%	15/322
Grade 2 – short of breath when hurrying or walking up a slight hill	18%	117/659	10%	68/659	7%	47/659
Grade 3 – walks slower than contemporaries on level ground because of breathlessness or has to stop for breath	20%	260/1287	13%	173/1287	10%	128/1287
Grade 4 – stops for breath after walking about 100 metres (109 yards) or after a few minutes on level ground	24%	615/2577	18%	452/2577	12%	316/2577
Grade 5 – too breathless to leave the house or breathless when dressing or undressing	30%	750/2479	23%	563/2479	16%	398/2479
Not known	24%	1149/4730	16%	767/4730	11%	539/4730
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: all P<0.001

MRC grade	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Grade 1 – not troubled by breathlessness except on strenuous exercise	23%	73/322	13%	41/322	8%	27/322
Grade 2 – short of breath when hurrying or walking up a slight hill	32%	211/659	20%	132/659	15%	97/659
Grade 3 – walks slower than contemporaries on level ground because of breathlessness or has to stop for breath	39%	500/1287	25%	321/1287	20%	251/1287
Grade 4 – stops for breath after walking about 100 metres (109 yards) or after a few minutes on level ground	45%	1158/2577	33%	842/2577	24%	627/2577
Grade 5 – too breathless to leave the house or breathless when dressing or undressing	51%	1265/2479	40%	992/2479	30%	745/2479
Not known	42%	1989/4730	28%	1333/4730	21%	974/4730
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: all P<0.001

5.2g Readmissions: relation to disease severity as measured by % predicted FEV_1, where available, and GOLD stage, where available

The two tables in the segment below relate 30- and 90-day readmissions to % predicted FEV_1 and GOLD stage. There is a clear relationship between increasing disease severity and both 30- and 90-day readmissions, whatever the reason for readmission. The trends seen were due to primarily to COPD, which established the trends for all-cause and other respiratory readmissions.

GOLD stage	One or more admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Stage I: Mild, ≥80% predicted FEV_1	18%	50/278	10%	29/278	7%	20/278
Stage II: Moderate, 50–79% predicted FEV_1	24%	342/1430	15%	212/1430	10%	149/1430
Stage III: Severe, 30–49% predicted FEV_1	25%	527/2120	18%	387/2120	13%	279/2120
Stage IV: Very severe, <30% predicted FEV_1	30%	372/1248	24%	304/1248	19%	235/1248
Not known	24%	1640/6978	16%	1113/6978	11%	760/6978
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: all P<0.001

GOLD stage	One or more admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Stage I: Mild, ≥80% predicted FEV_1	40%	111/278	23%	65/278	16%	45/278
Stage II: Moderate, 50–79% predicted FEV_1	43%	620/1430	27%	380/1430	20%	280/1430
Stage III: Severe, 30–49% predicted FEV_1	45%	953/2120	34%	725/2120	27%	562/2120
Stage IV: Very severe, <30% predicted FEV_1	50%	627/1248	42%	530/1248	35%	435/1248
Not known	41%	2885/6978	28%	1961/6978	20%	1399/6978
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: all P<0.001

5.2h Readmissions: relation to DECAF score, where available

We were able to calculate a modified DECAF score (see section on **inpatient mortality**) from some of the audited admission data. The two tables in the segment below represent 30- and 90-day readmissions against increasing modified DECAF score, for those patients in whom it could be calculated. The DECAF score seemed predictive of all-cause and respiratory-related readmission within 30 and 90 days, but the relationship was not observed for COPD readmissions. The observed trend in all-cause readmissions was due to non-COPD respiratory readmissions in the main.

Modified DECAF score	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
0	23%	306/1343	17%	222/1343	12%	164/1343
1	25%	519/2047	19%	379/2047	14%	279/2047
2	28%	321/1154	21%	237/1154	14%	162/1154
3	26%	93/357	21%	76/357	13%	48/357
4	30%	17/56	23%	13/56	13%	7/56
5	50%	1/2	50%	1/2	0%	0/2
Not known	24%	1674/7095	16%	1117/7095	11%	783/7095
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories (0, 1, 2, 3, 4, 5): P=0.05, P=0.05 and P=0.70, respectively

Modified DECAF score	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
0	42%	560/1343	31%	410/1343	24%	319/1343
1	45%	927/2047	33%	677/2047	25%	518/2047
2	45%	525/1154	35%	400/1154	26%	295/1154
3	48%	172/357	37%	131/357	25%	89/357
4	48%	27/56	36%	20/56	25%	14/56
5	100%	2/2	100%	2/2	0%	0/2
Not known	42%	2983/7095	28%	2021/7095	21%	1486/7095
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories (0, 1, 2, 3, 4, 5): P=0.10, P=0.09 and P=0.84, respectively

5.2i Readmissions: relation to initial pH

The two tables in the segment below relate 30- and 90-day readmissions to the initial arterial blood pH, where available. There is a clear relationship between acidosis on initial pH and subsequent readmission within both 30 and 90 days, the trend being observed for all-cause and COPD-related readmissions.

Initial pH	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
<7.26	27%	132/498	21%	107/498	15%	73/498
7.26–7.34	28%	390/1394	22%	310/1394	16%	222/1394
≥7.35	24%	1762/7266	17%	1226/7266	12%	859/7266
Not known	22%	647/2896	14%	402/2896	10%	289/2896
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: P=0.009, P<0.001. and P<0.001, respectively

Initial pH	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
<7.26	46%	229/498	36%	179/498	26%	128/498
7.26–7.34	47%	661/1394	38%	525/1394	30%	416/1394
≥7.35	43%	3098/7266	30%	2184/7266	22%	1607/7266
Not known	42%	1208/2896	27%	773/2896	20%	570/2896
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: P=0.002, P<0.001. and P<0.001, respectively

5.2j Readmissions: relation to acute treatment with NIV

The two tables in the segment below relate 30- and 90-day readmissions to treatment with NIV. Those who received NIV, but also those who were offered NIV but declined, had much higher than average readmission rates at both 30 and 90 days.

Treated with NIV	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Yes	29%	358/1253	23%	290/1253	17%	210/1253
No – not clinically indicated	24%	2429/10294	16%	1642/10294	11%	1156/10294
No – patient declined	39%	27/70	36%	25/70	29%	20/70
No – NIV not available	22%	5/23	22%	5/23	17%	4/23
No – reason unclear	26%	72/273	21%	57/273	13%	36/273
Patient intubated directly	29%	6/21	19%	4/21	14%	3/21
Not known	28%	34/120	18%	22/120	12%	14/120
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: all P<0.001

Treated with NIV	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Yes	48%	603/1253	39%	488/1253	29%	365/1253
No – not clinically indicated	42%	4347/10294	29%	2981/10294	22%	2214/10294
No – patient declined	54%	38/70	50%	35/70	43%	30/70
No – NIV not available	39%	9/23	35%	8/23	26%	6/23
No – reason unclear	47%	128/273	37%	101/273	25%	67/273
Patient intubated directly	62%	13/21	43%	9/21	38%	8/21
Not known	48%	58/120	33%	39/120	26%	31/120
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: all P<0.001

5.2k Readmissions: relation to the ceiling of care, as documented in the notes within 24 hours of the index admission

The two tables in the segment below relate 30- and 90-day readmissions to the escalation status documented in the case record, where found. The audit question asked for 'decision on ceiling of care (including cardiopulmonary resuscitation – CPR) documented in notes within 24 hours of admission (multiple answers possible)'. Numbers were small, but those with a 'no CPR' or 'escalation to NIV but not intubation' order had higher readmission rates than those with 'full escalation' orders. Alternatively, those with full escalation orders had fewer readmissions.

Decision on ceiling of care	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Yes – full escalation	22%	282/1303	15%	194/1303	11%	140/1303
Yes – escalation to NIV not for intubation	30%	290/956	25%	237/956	17%	165/956
Yes – no cardiopulmonary resuscitation	31%	359/1169	23%	272/1169	15%	180/1169
Yes – not for NIV	29%	30/104	23%	24/104	17%	18/104
No record of decision on ceiling of care	24%	1574/6494	17%	1085/6494	12%	773/6494
Not applicable	22%	390/1762	14%	247/1762	10%	168/1762
None of the above selected = no answer	22%	192/855	15%	126/855	11%	95/855

Decision on ceiling of care	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Yes – full escalation	39%	504/1303	27%	354/1303	21%	273/1303
Yes – escalation to NIV not for intubation	50%	480/956	42%	404/956	31%	296/956
Yes – no cardiopulmonary resuscitation	51%	599/1169	40%	468/1169	28%	331/1169
Yes – not for NIV	53%	55/104	38%	40/104	28%	29/104
No record of decision on ceiling of care	43%	2803/6494	30%	1934/6494	22%	1447/6494
Not applicable	41%	716/1762	27%	468/1762	20%	344/1762
None of the above selected = no answer	40%	338/855	26%	224/855	20%	168/855

5.2l Readmissions: relation to ward of management

The two tables in the segment below relate 30- and 90-day readmissions to the ward of management during the index admission. Those managed on a medical or respiratory HDU during the index admission had higher 30- and 90-day readmission.

Ward(s) patient managed on during admission	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Respiratory ward	26%	1289/5027	19%	943/5027	13%	661/5027
Medical/respiratory HDU	30%	128/421	25%	106/421	19%	81/421
Respiratory ward and/or medical/respiratory HDU	26%	1353/5232	19%	997/5232	13%	701/5232
Other	23%	1578/6822	15%	1048/6822	11%	742/6822
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Fisher's exact test (respiratory ward and/or medical/respiratory HDU v other): P=0.001, P<0.001 and P<0.001, respectively

Ward(s) patient managed on during admission	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Respiratory ward	45%	2262/5027	33%	1672/5027	25%	1246/5027
Medical/respiratory HDU	47%	199/421	39%	164/421	30%	125/421
Respiratory ward and/or medical/respiratory HDU	45%	2362/5232	34%	1758/5232	25%	1311/5232
Other	42%	2834/6822	28%	1903/6822	21%	1410/6822
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Fisher's exact test (respiratory ward and/or medical/respiratory HDU v other): all P<0.001

5.2m Readmissions: relation to consultant/specialist at discharge

The two tables in the segment below represent 30- and 90-day readmission rates according to the specialist managing the patient at point of discharge. Readmission rates for Respiratory Consultants seemed higher.

Under whose care when decision to discharge or transfer to early discharge scheme (multiples possible)	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Acute Medicine Consultant	22%***	862/3903	15%***	571/3903	11%**	411/3903
Respiratory Consultant	26%***	1569/6083	19%***	1141/6083	13%***	803/6083
Care of the Elderly Consultant	24%	295/1217	16%	199/1217	11%	133/1217

***P<0.001, **0.001≤P<0.01, *0.01≤P<0.05 (Fisher's exact test for presence v absence of specified consultant)

Under whose care when decision to discharge or transfer to early discharge scheme (multiples possible)	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Acute Medicine Consultant	40%***	1556/3903	27%***	1042/3903	20%***	786/3903
Respiratory Consultant	45%***	2746/6083	33%***	2030/6083	25%***	1505/6083
Care of the Elderly Consultant	44%	537/1217	29%	350/1217	21%	251/1217

***P<0.001, **0.001≤P<0.01, *0.01≤P<0.05 (Fisher's exact test for presence v absence of specified consultant)

5.2n Readmissions: relation to whether discharged under care of COPD team or early supported discharge service or equivalent

The two tables in the segment below relate 30- and 90-day readmissions to acceptance by a COPD team or early supported discharge service or equivalent. Lower percentages of patients were readmitted (particularly all-cause) within both 30 and 90 days if accepted into the care of such schemes, and if compared with those either reviewed but not accepted or those considered unsuitable.

Evidence that patient was discharged under the care of a COPD team/early supported discharge service or equivalent	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Yes	23%	1156/4920	17%	831/4920	12%	594/4920
Reviewed by early discharge scheme but not accepted	27%	281/1046	20%	210/1046	15%	153/1046
Not suitable for referral to early discharge scheme	28%	376/1353	19%	253/1353	13%	170/1353
Not recorded	25%	775/3155	16%	515/3155	11%	358/3155
Not available	22%	343/1580	15%	236/1580	11%	168/1580
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: P<0.001, P=0.004, P=0.02, respectively

Evidence that patient was discharged under the care of a COPD team/early supported discharge service or equivalent	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Yes	42%	2062/4920	31%	1517/4920	23%	1149/4920
Reviewed by early discharge scheme but not accepted	48%	505/1046	35%	367/1046	27%	284/1046
Not suitable for referral to early discharge scheme	47%	630/1353	32%	435/1353	23%	310/1353
Not recorded	43%	1352/3155	28%	896/3155	20%	644/3155
Not available	41%	647/1580	28%	446/1580	21%	334/1580
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: all P<0.001

5.2o Readmissions: relation to venue of discharge

The two tables in the segment below relate 30- and 90-day admission rates to the venue of discharge. All-cause readmission rates at both 30 and 90 days seem high for those discharged to community hospitals, and particularly so for those discharged to sheltered accommodation, although note that the numbers are small for each group.

Patient was discharged to:	One or more all-cause admission ≤30 days		One or more respiratory admission ≤30 days		One or more COPD admission ≤30 days	
Community hospital / rehabilitation ward or equivalent	27%	57/212	18%	38/212	11%	23/212
Residential placement	25%	131/526	19%	100/526	11%	59/526
Sheltered accommodation	33%	84/252	23%	59/252	18%	46/252
House/flat alone	24%	901/3693	17%	620/3693	12%	458/3693
House/flat with another person	24%	1442/6110	17%	1019/6110	11%	702/6110
Other	31%	56/183	22%	41/183	16%	30/183
Not known	24%	260/1078	16%	168/1078	12%	125/1078
Total	**24%**	**2931/12054**	**17%**	**2045/12054**	**12%**	**1443/12054**

Chi-squared test between known categories: P=0.007, P=0.02 and P=0.02, respectively

Patient was discharged to	One or more all-cause admission ≤90 days		One or more respiratory admission ≤90 days		One or more COPD admission ≤90 days	
Community hospital / rehabilitation ward or equivalent	47%	99/212	30%	64/212	21%	44/212
Residential placement	43%	225/526	33%	171/526	21%	111/526
Sheltered accommodation	57%	143/252	39%	98/252	31%	77/252
House/flat alone	44%	1631/3693	31%	1131/3693	23%	863/3693
House/flat with another person	42%	2548/6110	30%	1821/6110	22%	1342/6110
Other	48%	87/183	37%	67/183	28%	52/183
Not known	43%	463/1078	29%	309/1078	22%	232/1078
Total	**43%**	**5196/12054**	**30%**	**3661/12054**	**23%**	**2721/12054**

Chi-squared test between known categories: P<0.001, P=0.02 and P=0.009

Section 6: Previous/recent admissions

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Key findings/observations

- 36% of patients had **at least one admission within the 90 days prior** to their index admission.
- 51% of patients had **at least one admission within the 180 days prior** to their index admission.
- 65% of patients had **at least one admission within the 365 days prior** to their index admission.
- Index admission inpatient mortality was slightly higher if there had been one or more previous admission (eg 5.1% if admitted in the previous 90 days compared with 4.1% if not admitted), but generally there was a weak association with the number of admissions in the previous 365, 180 and 90 days. There were, however, stronger associations with mortality within 30 and 90 days after index admission.
- The strongest associations were seen between the number of COPD and non-COPD admissions in the 90 days prior to the index admission and mortality at 90 days, with mortality rates particularly high (around 20%) in those with four or more admissions prior to the index admission.
- There was a strong association between prior admission for COPD, particularly in the 90 days before the index admission, and increasing LOS.
- There was a very strong association between prior admission, particularly for those admitted in the 90 days prior to the index admission, and subsequent readmission in the 30 and 90 days following the index discharge. This relationship held true for both COPD- and non-COPD-coded preadmissions.
- The greater the number of previous admissions, the greater was the chance of subsequent readmission within 30 and 90 days after discharge from the index admission.
- The associations between preadmission and mortality, LOS or readmission were strongest for those admitted within the previous 90 days, although associations still existed to a lesser degree for patients admitted in the 180 or 365 days prior to the index admission.

Suggested areas for improvement

- Admitting teams should **pay greater attention to the recent admission history** of their patients, and try to understand specifically what has caused the readmission.

Navigation

This section contains the following tables. If viewing this report on a computer, you can select the chart that you wish to go to by selecting it from the list below.

Although previous/recent hospital admission is a known association of mortality, it is not often taken into account by clinical teams as they consider the medical management, onward care or discharge planning for

their patients. We feel it important, therefore, to highlight some of the notable relationships between previous/recent admissions and outcomes for patients included in the audit.

We have extracted HES data to determine the number of all-cause and COPD-coded admissions for each audited patient in the 3 months, 6 months and 1 year prior to their index event. We have tabulated the relationships between these admissions and outcomes for both the inpatient stay and at 30/90 days after the index admission. Mortality data relate to 30/90 days after discharge.

Section 6.1: General previous/recent admission data

6.1a Number of admissions in the 90, 180 and 365 days prior to the index admission

The tables in this segment demonstrate the number of COPD admissions, non-COPD admissions and total admissions that patients had in the 90, 180 and 365 days prior to their audit index admission. 36% (4574/12594) had one or more admission in total within 90 days prior to the index admission, 51% (6404/12594) within 180 days and 65% (8135/12594) within 365 days. This emphasises the importance of structured discharge planning.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	10263	(81.5%)	9173	(72.8%)	8075	(64.1%)
One	1714	(13.6%)	2129	(16.9%)	2305	(18.3%)
Two	433	(3.4%)	707	(5.6%)	981	(7.8%)
Three	114	(0.9%)	304	(2.4%)	519	(4.1%)
Four	39	(0.3%)	137	(1.1%)	256	(2.0%)
Five or more	31	(0.2%)	144	(1.1%)	458	(3.6%)
Total	**12594**	**(100%)**	**12594**	**(100%)**	**12594**	**(100%)**

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	9610	(76.3%)	7968	(63.3%)	6088	(48.3%)
One	2074	(16.5%)	2705	(21.5%)	2854	(22.7%)
Two	611	(4.9%)	1089	(8.6%)	1625	(12.9%)
Three	176	(1.4%)	435	(3.5%)	834	(6.6%)
Four	68	(0.5%)	174	(1.4%)	468	(3.7%)
Five or more	55	(0.4%)	223	(1.8%)	725	(5.8%)
Total	**12594**	**(100%)**	**12594**	**(100%)**	**12594**	**(100%)**

Number of COPD admissions in 90 days before audit index admission	Number of non-COPD admissions in 90 days before audit index admission						Total
	None	One	Two	Three	Four	Five or more	
None	8020	1583	438	129	52	41	10263
One	1180	363	116	37	10	8	1714
Two	291	87	42	4	4	5	433
Three	81	19	9	4	0	1	114
Four	24	12	2	0	1	0	39
Five or more	14	10	4	2	1	0	31
Total	**9610**	**2074**	**611**	**176**	**68**	**55**	**12594**

Number of COPD admissions in 180 days before audit index admission	Number of non-COPD admissions in 180 days before audit index admission						Total
	None	One	Two	Three	Four	Five or more	
None	6190	1801	686	269	96	131	9173
One	1210	534	224	89	35	37	2129
Two	335	199	95	30	23	25	707
Three	135	85	40	19	10	15	304
Four	53	42	17	14	5	6	137
Five or more	45	44	27	14	5	9	144
Total	**7968**	**2705**	**1089**	**435**	**174**	**223**	**12594**

Number of COPD admissions in 365 days before audit index admission	Number of non- COPD admissions in 365 days before audit index admission						Total
	None	One	Two	Three	Four	Five or more	
None	4459	1715	920	413	229	339	8075
One	990	577	333	167	109	129	2305
Two	333	268	168	84	35	93	981
Three	161	125	76	66	34	57	519
Four	52	73	51	37	17	26	256
Five or more	93	96	77	67	44	81	458
Total	**6088**	**2854**	**1625**	**834**	**468**	**725**	**12594**

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	8020	(63.7%)	6190	(49.2%)	4459	(35.4%)
One	2763	(21.9%)	3011	(23.9%)	2705	(21.5%)
Two	1092	(8.7%)	1555	(12.3%)	1830	(14.5%)
Three	413	(3.3%	827	(6.6%)	1175	(9.3%)
Four	174	(1.4%)	418	(3.3%)	741	(5.9%)
Five or more	132	(1.0%)	593	(4.7%)	1684	(13.4%)
Total	**12594**	**(100%)**	**12594**	**(100%)**	**12594**	**(100%)**

6.1b Effect of admissions in the 90, 180 and 365 days prior to the index audit admission: relation to inpatient mortality

The tables in this segment reflect the relationship between the number of previous admissions (COPD-related, non-COPD-related, total in the 90, 180 and 365 days prior to the index admission) and inpatient mortality. The percentages and numbers in each cell of the main body of the tables relate to inpatient mortality (total 4.3%, 540/12594). The third table below suggests higher mortality rates of about 1% (ie within 90 days prior; 3.9% v 5.0%) with previous admission.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	4.1%	421/10263	4.0%	371/9173	4.1%	330/8075
One	5.5%	95/1714	5.7%	121/2129	5.1%	117/2305
Two	3.5%	15/433	3.7%	26/707	4.7%	46/981
Three	4.4%	5/114	4.6%	14/304	3.5%	18/519
Four	5.1%	2/39	2.9%	4/137	5.1%	13/256
Five or more	6.5%	2/31	2.8%	4/144	3.5%	16/458
One or more	5.1%	119/2331	4.9%	169/3421	4.6%	210/4519

Chi-squared test between categories: P=0.13, P=0.02 and P=0.25, respectively
Fisher's exact test between none v one or more: P=0.03, P=0.03 and P=0.14, respectively

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	4.1%	391/9610	4.1%	325/7968	4.1%	250/6088
One	4.8%	99/2074	4.3%	116/2705	4.4%	126/2854
Two	5.6%	34/611	5.0%	54/1089	4.9%	79/1625
Three	5.1%	9/176	5.3%	23/435	4.6%	38/834
Four	1.5%	1/68	6.9%	12/174	4.5%	21/468
Five or more	10.9%	6/55	4.5%	10/223	3.6%	26/725
One or more	5.0%	149/2984	4.6%	215/4626	4.5%	290/6506

Chi-squared test between categories: P=0.03, P=0.31 and P=0.71, respectively
Fisher's exact test between none v one or more: P=0.03, P=0.13 and P=0.33, respectively

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	3.9%	311/8020	3.8%	236/6190	3.7%	167/4459
One or more	5.0%	229/4574	4.7%	304/6404	4.6%	373/8135
Total	**4.3%**	**540/12594**	**4.3%**	**540/12594**	**4.3%**	**540/12594**

Fisher's exact test between none v one or more: P=0.003, P=0.01 and P=0.03, respectively

6.1c Effect of admissions in the 90, 180 and 365 days prior to the index audit admission: relation to mortality 30 days after the index admission

The tables in this segment reflect the relationship between the number of previous admissions (COPD-related, non-COPD-related, total in the 90, 180 and 365 days prior to the index admission) and mortality at 30 days from the index admission. The percentages and numbers in each cell of the main body of the tables relate to 30-day mortality (total all-causes 6.7%, 846/12594). Note the clear relationship between previous admission and mortality at 30 days, emphasising the importance of taking previous admission into account when discharge planning.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	6.2%	634/10263	6.1%	555/9173	6.0%	486/8075
One	9.4%	161/1714	9.4%	200/2129	8.3%	192/2305
Two	8.1%	35/433	7.4%	52/707	8.2%	80/981
Three	6.1%	7/114	6.3%	19/304	6.9%	36/519
Four	15.4%	6/39	5.1%	7/137	7.4%	19/256
Five or more	9.7%	3/31	9.0%	13/144	7.2%	33/458
One or more	9.1%	212/2331	8.5%	291/3421	8.0%	360/4519

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	6.2%	593/9610	6.1%	488/7968	5.8%	355/6088
One	7.9%	164/2074	6.9%	186/2705	7.3%	207/2854
Two	9.3%	57/611	8.6%	94/1089	7.8%	127/1625
Three	10.8%	19/176	7.8%	34/435	7.3%	61/834
Four	8.8%	6/68	10.9%	19/174	7.3%	34/468
Five or more	12.7%	7/55	11.2%	25/223	8.6%	62/725
One or more	8.5%	253/2984	7.7%	358/4626	7.5%	491/6506

Fisher's exact test between none v one or more: P<0.001, P=0.001 and P<0.001, respectively

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	5.7%	461/8020	5.6%	345/6190	5.3%	237/4459
One or more	8.4%	385/4574	7.8%	501/6404	7.5%	609/8135
Total	**4.3%**	**540/12594**	**4.3%**	**540/12594**	**4.3%**	**540/12594**

Fisher's exact test between none v one or more: all P<0.001

6.1d Effect of previous admissions in the 90, 180 and 365 days prior to the index admission: relation to mortality 90 days after the index admission

The tables in this segment reflect the relationship between the number of previous admissions (COPD-related, non-COPD-related, total in the 90, 180 and 365 days prior to the index admission) and mortality 90 days after the index admission. The percentages and numbers in each cell of the main body of the tables relate to 90-day mortality (total all-causes 12.0%, 1508/12594). Note the clear relationship between previous admission and mortality at 90 days, again emphasising the importance of careful discharge planning and care coordination for patients with multiple admissions.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	10.7%	1101/10263	10.2%	940/9173	10.0%	808/8075
One	17.7%	304/1714	16.9%	359/2129	15.1%	348/2305
Two	15.5%	67/433	17.3%	122/707	16.4%	161/981
Three	18.4%	21/114	15.1%	46/304	14.6%	76/519
Four	23.1%	9/39	11.7%	16/137	17.2%	44/256
Five or more	19.4%	6/31	17.4%	25/144	15.5%	71/458
One or more	17.5%	407/2331	16.6%	568/3421	15.5%	700/4519

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	10.7%	1024/9610	10.4%	825/7968	9.7%	590/6088
One	15.2%	316/2074	13.0%	352/2705	12.9%	369/2854
Two	18.7%	114/611	16.6%	181/1089	14.4%	234/1625
Three	16.5%	29/176	14.7%	64/435	15.3%	128/834
Four	22.1%	15/68	23.6%	41/174	15.4%	72/468
Five or more	18.2%	10/55	20.2%	45/223	15.9%	115/725
One or more	16.2%	484/2984	14.8%	683/4626	14.1%	918/6506

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	9.7%	774/8020	8.8%	546/6190	8.3%	368/4459
One or more	16.0%	734/1454	15.0%	962/6404	14.0%	1140/8135
Total	**12.0%**	**1508/12594**	**12.0%**	**1508/12594**	**12.0%**	**1508/12594**

Fisher's exact test between none v one or more: all P<0.001

6.1e Effect of previous admissions in the 90, 180 and 365 days prior to the index admission: relation to length of stay

The tables in this segment reflect the relationship between the number of previous admissions (COPD-related, non-COPD, total in the 90, 180 and 365 days prior to the index admission) and length of stay during the index admission. There is a clear relationship between previous admission and increasing LOS. These observational audit data do not allow us to determine whether the increased LOS is due to disease complexity/multimorbidity, or difficulties in effecting discharge for patients with frequent admissions.

The percentages and numbers in each cell of the main body of the first three tables relate the number of previous admissions and patients with a LOS greater than 7 days (25%, 3008/12032).

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	23%	2297/9827	23%	2013/8788	22%	1727/7734
One	31%	498/1614	29%	579/2004	28%	614/2184
Two	35%	144/416	32%	216/677	30%	283/930
Three	40%	44/109	36%	104/290	28%	141/499
Four	41%	15/37	34%	45/133	42%	101/243
Five or more	34%	10/29	36%	51/140	32%	142/442
One or more	32%	711/2205	31%	995/3244	30%	1281/4298

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	24%	2177/9202	23%	1752/7632	22%	1310/5830
One	29%	566/1971	28%	712/2581	25%	682/2724
Two	33%	189/577	31%	323/1033	28%	429/1542
Three	28%	46/166	25%	104/412	29%	233/794
Four	25%	17/67	38%	61/161	34%	151/446
Five or more	27%	13/49	26%	56/213	29%	203/696
One or more	29%	831/2830	29%	1256/4400	27%	1698/6202

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	22%	1704/7697	21%	1248/5948	20%	875/4289
One or more	30%	1304/4335	29%	1760/6084	28%	2133/7743
Total	**25%**	**3008/12032**	**25%**	**3008/12032**	**25%**	**3008/12032**

Fisher's exact test between none v one or more: all P<0.001

The numbers in each cell of the main body of the next three tables relate to mean, median (IQR) of LOS (overall 6.2, 4 (2–8) days).

Number of COPD admissions prior to audit index admission	Within 90 days prior	Within 180 days prior	Within 365 days prior
None	5.9, 4 (2–7)	5.8, 4 (2–7)	5.7, 4 (2–7)
One	7.5, 4 (2–9)	6.9, 4 (2–8)	6.7, 4 (2–8)
Two	7.6, 5 (2–9)	7.7, 4 (2–9)	7.3, 5 (2–9)
Three	8.6, 6 (3–10)	8.0, 5 (2–10)	7.2, 4 (2–8)
Four	7.5, 6 (2–11)	7.6, 5 (2–10)	8.8, 6 (3–11)
Five or more	8.5, 5 (3–9)	7.4, 5 (2–9)	7.1, 5 (2–9)
One or more	7.6, 5 (2–9)	7.2, 4 (2–9)	7.1, 4 (2–9)

Mann–Whitney test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior	Within 180 days prior	Within 365 days prior
None	5.9, 4 (2–7)	5.8, 4 (2–7)	5.7, 4 (2–7)
One	6.9, 4 (2–8)	6.6, 4 (2–8)	6.2, 4 (2–8)
Two	7.4, 5 (2–9)	7.1, 5 (2–9)	6.6, 4 (2–8)
Three	8.3, 4 (2–8)	6.9, 4 (2–8)	6.8, 4 (2–8)
Four	7.0, 5 (2–8)	8.4, 5 (3–9)	7.8, 5 (3–9)
Five or more	5.8, 4 (2–8)	6.8, 4 (2–8)	7.2, 4 (2–8)
One or more	7.0, 4 (2–8)	6.8, 4 (2–8)	6.6, 4 (2–8)

Mann–Whitney test between none v one or more: all P<0.001

Number of COPD + non-COPD admissions prior to audit index admission	Within 90 days prior	Within 180 days prior	Within 365 days prior
None	5.7, 4 (2–7)	5.5, 4 (2–7)	5.4, 3 (2–7)
One or more	7.1, 4 (2–9)	6.8, 4 (2–8)	6.6, 4 (2–8)
Total	**6.2, 4 (2–8)**	**6.2, 4 (2–8)**	**6.2, 4 (2–8)**

Mann–Whitney test between none v one or more: all P<0.001

6.1f Effect of previous admissions in the 90, 180 and 365 days prior to the index admission: relation to 30/90-day readmission

The next table groupings demonstrate relationships between previous admission and subsequent readmission within 30 or 90 days of the index spell. The data are split to show readmission rates by both cause of previous admission and cause of readmission. There is a clear relationship between the number of previous admissions and subsequent readmission rates. The relationship holds true whatever the cause of previous admission, but seems tighter (remember that these are observational data) for patients having one or more previous admissions in the 90 days before their index spell.

One or more readmissions of any cause within 30 days of discharge

The first three tables in this segment show all-cause readmissions within 30 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD and total COPD + non-COPD). The percentages and numbers in each cell of the main body of the tables relate to readmissions within 30 days of discharge (overall 24%, 2931/12054); the greater the number of previous admissions, the greater was the chance of subsequent readmission within 30 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	21%	2061/9842	20%	1732/8802	19%	1460/7745
One	36%	578/1619	32%	639/2008	27%	596/2188
Two	44%	185/418	38%	256/681	35%	330/935
Three	55%	60/109	44%	129/290	37%	184/501
Four	65%	24/37	58%	77/133	45%	109/243
Five or more	79%	23/29	70%	98/140	57%	252/442
One or more	39%	870/2212	37%	1199/3252	34%	1471/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	21%	1952/9219	20%	1504/7643	18%	1039/5838
One	31%	603/1975	28%	720/2589	25%	688/2728
Two	37%	215/577	33%	338/1035	28%	440/1546
Three	50%	83/167	42%	175/412	33%	265/796
Four	63%	42/67	44%	71/162	34%	150/447
Five or more	73%	36/49	58%	123/213	50%	349/699
One or more	35%	979/2835	32%	1427/4411	30%	1892/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	18%	1407/7709	16%	957/5954	15%	630/4292
One or more	35%	1524/4345	32%	1974/6100	30%	2301/7762
Total	**24%**	**2931/12054**	**24%**	**2931/12054**	**24%**	**2931/12054**

Fisher's exact test between none v one or more: all P<0.001

One or more respiratory readmissions within 30 days of discharge

The next two tables in this segment show respiratory-coded readmissions within 30 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD). The percentages and numbers in each cell of the main body of the tables relate to respiratory readmissions within 30 days of discharge (overall 17%, 2045/12054); the greater the number of previous admissions, the greater was the chance of subsequent readmission within 30 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	14%	1345/9842	12%	1099/8802	12%	891/7745
One	28%	460/1619	24%	482/2008	21%	450/2188
Two	35%	147/418	31%	208/681	27%	256/935
Three	48%	52/109	35%	102/290	29%	147/501
Four	54%	20/37	49%	65/133	35%	85/243
Five or more	72%	21/39	64%	89/140	49%	216/442
One or more	32%	700/2212	29%	946/3252	27%	1154/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	15%	1396/9219	14%	1097/7643	13%	762/5838
One	22%	425/1975	19%	499/2589	18%	492/2728
Two	24%	141/577	22%	229/1035	20%	307/1546
Three	31%	51/167	28%	117/412	24%	189/796
Four	24%	16/67	32%	52/162	23%	104/447
Five or more	33%	16/49	24%	51/213	27%	191/699
One or more	23%	649/2835	21%	948/4411	21%	1283/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	12%	949/7709	11%	644/5954	10%	421/4292
One or more	25%	1096/4345	23%	1401/6100	21%	1624/7762
Total	**17%**	**2045/12054**	**17%**	**2045/12054**	**17%**	**2045/12054**

Fisher's exact test between none v one or more: all P<0.001

One or more COPD readmissions within 30 days of discharge

The next two tables in this segment show COPD-coded readmissions within 30 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD). The percentages and numbers in each cell of the main body of the tables relate to COPD-coded readmissions within 30 days of discharge (overall 12%, 1443/12054); the greater the number of previous admissions, the greater was the chance of subsequent readmission within 30 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	9%	908/9842	8%	720/8802	7%	578/7745
One	21%	346/1619	18%	356/2008	15%	324/2188
Two	26%	110/418	23%	156/681	19%	175/935
Three	39%	43/109	28%	82/290	23%	115/501
Four	46%	17/37	38%	51/133	28%	68/243
Five or more	6%	19/29	56%	78/140	41%	183/442
One or more	24%	535/2212	22%	723/3252	20%	865/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	11%	1009/9219	10%	794/7643	10%	560/5838
One	15%	288/1975	14%	360/2589	13%	350/2728
Two	17%	96/577	14%	147/1035	14%	209/1546
Three	20%	34/167	20%	81/412	16%	129/796
Four	12%	8/67	21%	34/162	15%	69/447
Five or more	16%	8/49	13%	27/213	18%	126/699
One or more	15%	434/2835	15%	649/4411	14%	883/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	8%	648/7709	7%	429/5954	7%	286/4292
One or more	18%	795/4345	17%	1014/6100	15%	1157/7762
Total	**12%**	**1443/12054**	**12%**	**1443/12054**	**12%**	**1443/12054**

Fisher's exact test between None v One or more: all P<0.001

One or more readmissions within 90 days of discharge

The next three tables in this segment show all-cause readmissions within 90 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD and COPD/non-COPD). The percentages and numbers in each cell of the main body of the tables relate to readmissions within 90 days of discharge (overall 43%, 5196/12054); the greater the number of previous admissions, the greater was the chance of subsequent readmission within 90 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	38%	3789/9842	36%	3179/8802	34%	2657/7745
One	60%	968/1619	56%	1117/2008	49%	1075/2188
Two	71%	295/418	66%	450/681	61%	571/935
Three	78%	85/109	75%	219/290	69%	347/501
Four	84%	31/37	80%	106/133	76%	184/243
Five or more	97%	28/29	89%	125/140	82%	362/442
One or more	64%	1407/2212	62%	2017/3252	59%	2539/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	38%	3525/9219	35%	2679/7643	31%	1834/5838
One	55%	1082/1975	52%	1352/2589	47%	1273/2728
Two	64%	367/577	58%	601/1035	52%	809/1546
Three	74%	124/167	69%	283/412	60%	477/796
Four	82%	55/67	69%	111/162	62%	279/447
Five or more	88%	43/49	80%	170/213	75%	524/699
One or more	59%	1671/2835	57%	2517/4411	54%	3362/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	34%	2615/7709	29%	1740/5954	25%	1092/4292
One or more	59%	2581/4345	57%	3456/6100	53%	4104/7762
Total	**43%**	**5196/12054**	**43%**	**5196/12054**	**43%**	**5196/12054**

Fisher's exact test between none v one or more: all P<0.001

One or more respiratory readmissions within 90 days of discharge

The next two tables in this segment show respiratory-coded readmissions within 90 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD). The percentages and numbers in each cell of the main body of the tables relate to respiratory readmissions within 90 days of discharge (overall 30%, 3661/12054); the greater the number of previous admissions, the greater was the chance of subsequent readmission within 90 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	25%	2484/9842	23%	2016/8802	21%	1598/7745
One	49%	796/1619	43%	871/2008	38%	832/2188
Two	60%	250/418	55%	377/681	49%	457/935
Three	71%	77/109	62%	181/290	58%	291/501
Four	76%	28/37	73%	97/133	63%	153/243
Five or more	90%	26/29	85%	119/140	75%	330/442
One or more	53%	1177/2212	51%	1645/3252	48%	2063/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	28%	2540/9219	26%	1952/7643	23%	1351/5838
One	38%	745/1975	37%	949/2589	33%	907/2728
Two	42%	242/577	39%	402/1035	37%	566/1546
Three	48%	80/167	46%	191/412	41%	328/796
Four	46%	31/67	50%	81/162	43%	190/447
Five or more	47%	23/49	40%	86/213	46%	319/699
One or more	40%	1121/2835	39%	1709/4411	37%	2310/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	23%	1762/7709	20%	1167/5954	17%	731/4292
One or more	44%	1899/4345	41%	2494/6100	38%	2930/7762
Total	**30%**	**3661/12054**	**30%**	**3661/12054**	**30%**	**3661/12054**

Fisher's exact test between none v one or more: all P<0.001

One or more COPD readmissions within 90 days of discharge

The next two tables in this segment show COPD-coded readmissions within 90 days of the index discharge. The tables present the readmission data according to the cause of prior admission (COPD, non-COPD). The percentages and numbers in each cell of the main body of the tables relate to COPD readmissions within 90 days of discharge (overall 23%, 2721/12054; the greater the number of previous admissions, the greater was the chance of subsequent readmission within 90 days after discharge.

Number of COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	18%	1758/9842	16%	1378/8802	14%	1066/7745
One	40%	642/1619	34%	676/2008	29%	626/2188
Two	50%	208/418	46%	310/681	37%	346/935
Three	60%	65/109	55%	160/290	49%	247/501
Four	65%	24/37	65%	86/133	56%	135/243
Five or more	83%	24/29	79%	111/140	68%	301/442
One or more	44%	963/2212	41%	1343/3252	38%	1655/4309

Fisher's exact test between none v one or more: all P<0.001

Number of non-COPD admissions prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	21%	1917/9219	19%	1472/7643	17%	1019/5838
One	27%	534/1975	28%	713/2589	25%	681/2728
Two	31%	181/577	28%	292/1035	27%	421/1546
Three	32%	54/167	33%	135/412	30%	238/796
Four	27%	18/67	33%	53/162	33%	146/447
Five or more	35%	17/49	26%	56/213	31%	216/699
One or more	28%	804/2835	28%	1249/4411	27%	1702/6216

Fisher's exact test between none v one or more: all P<0.001

Total number of admissions COPD + non-COPD prior to audit index admission	Within 90 days prior		Within 180 days prior		Within 365 days prior	
None	16%	1270/7709	14%	821/5954	12%	510/4292
One or more	33%	1451/4345	31%	1900/6100	28%	2211/7762
Total	**23%**	**2721/12054**	**23%**	**2721/12054**	**23%**	**2721/12054**

Fisher's exact test between none v one or more: all P<0.001

For further information on the overall audit programme or any of the workstreams, please see our website or contact the National COPD Audit Programme team directly:

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