



Royal College  
of Physicians

# NACAP

National Asthma and Chronic Obstructive  
Pulmonary Disease Audit Programme (NACAP)

## Adult asthma clinical audit 2018/19

Adults with asthma attacks admitted to hospitals in England, Scotland  
and Wales from 1 November 2018 and discharged by 31 March 2019

## Data analysis and methodology report

Published December 2019



In association with:

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General Practitioners



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## NACAP

NACAP is a programme of work that aims to improve the quality of care, services and clinical outcomes for patients with asthma and COPD in England, Scotland and Wales. Spanning the entire patient care pathway, NACAP includes strong collaboration with asthma and COPD patients, as well as healthcare professionals, and aspires to set out a vision for a service which puts patient needs first. To find out more about the NACAP visit: [www.rcplondon.ac.uk/nacap](http://www.rcplondon.ac.uk/nacap).

## Adult asthma clinical audit 2018/19 report

This report was prepared by the following people, on behalf of the NACAP asthma advisory group (the full list of members is included on the NACAP resources page: [www.rcplondon.ac.uk/nacap-resources](http://www.rcplondon.ac.uk/nacap-resources)):

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## How to use this report

### 1. Scope and data collection

This report presents results of an analysis of data derived from the adult asthma component of the National Asthma and COPD Audit Programme (NACAP). The adult asthma audit is continuous and has been running since 1 November 2018. The audit captures the processes and clinical outcomes of treatment for adult patients admitted with asthma attacks to hospitals in England, Scotland and Wales.

This report, which is the first since the launch of the audit, presents data describing the cohort of patients that arrived at hospital on or after 1 November 2018, who were admitted to adult services *and* were discharged by 31 March 2019. The analysis has been conducted to provide baseline audit data and to support the formulation of quality improvement activities.

### 2. Report structure

These data are presented largely in tabular form with explanatory notes where appropriate. However, the key messages can be found in the national report (via [www.rcplondon.ac.uk/adult-asthma-2018-19](http://www.rcplondon.ac.uk/adult-asthma-2018-19)). These data will also be made publicly available at hospital level on [www.data.gov.uk](http://www.data.gov.uk), in line with the government's transparency agenda. Details of the statistical, data collection and information governance methodologies used are provided in [Appendix A](#).

Nationally benchmarked results for participating hospitals across England, Scotland and Wales have been provided in [section 8](#) of the report. The median values for each hospital are presented alongside the national medians for each indicator. Hospital level results are colour coded in accordance with whether the hospital falls within the upper quartile, the middle two quartiles, or the lower quartile.

### 3. Report coverage

The data presented here are based on the first five months of audit data collected as hospitals joined the continuous audit and began entering data onto the NACAP web tool. Therefore, data on only a proportion of eligible admissions for patients with asthma attacks were submitted and included in this audit report. It is important to note that a number of analyses have been calculated using small numbers (for instance, analyses of inpatient deaths). Caution must be used in interpreting analyses where the sample size is small as analyses may be underpowered and associations seen may occur by chance.

National breakdowns in this round of reporting do not account for Scotland. Scottish audit data are included in the 'All' figures, but are not presented separately in this report, unlike for England and Wales. The low rate of recruitment to the audit in Scotland, during the first 7 months of continuous data collection, provides small numbers (96 cases) that cannot be meaningfully analysed as a representative sample of Scottish asthma care. We look forward to providing Scotland level figures in future reports for the adult asthma audit, once hospital and case ascertainment has increased.

The NACAP follows rules on suppression of small numbers in national reporting where it may be possible to identify an individual patient in any data presented. In this report, it was deemed appropriate and safe to include small numbers in national data tables without suppression for the following reasons:

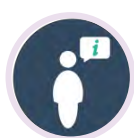
- These data are presented at national aggregate level. It is not possible to combine this national aggregate data in any way which could identify an individual.
- These data are of a sample of the eligible patients that could have been included in the audit; it is not possible to ascertain which eligible patients were included, and which were not, in the data presented here.

#### **4. Audience and links to relevant guidelines and standards**

The report is intended to be read by healthcare professionals, NHS managers, chief executives and board members, as well as service commissioners, policymakers and voluntary organisations. A separate report has been produced for patients and the public and is available at:

[www.rcplondon.ac.uk/adult-asthma-2018-19](http://www.rcplondon.ac.uk/adult-asthma-2018-19).

References to the appropriate National Institute for Health and Care Excellence (NICE) quality standards, British Thoracic Society (BTS) / Scottish Intercollegiate Guidelines Network (SIGN) guideline on the management of asthma, and National Review of Asthma Deaths (NRAD) 2014 report recommendations are inserted throughout the key findings. Copies of our datasets and all other resources can be found via our website: [www.rcplondon.ac.uk/nacap-adult-asthma](http://www.rcplondon.ac.uk/nacap-adult-asthma).



## Section 1: General information

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### Navigation

This section contains the following tables and graphs. If you are viewing this report on an electronic device, you can select the table that you wish to see from the list below.

- **1.1 Age**
- **1.2 Gender**
- **1.3 Socioeconomic status**
  - 1.3.1 Index of Multiple Deprivation measures by national quintile in England and Wales
- **1.4 Arrival**
  - 1.4.1 Median number of admissions per hospital
  - 1.4.2 Day and time of arrival at hospital
- **1.5 Length of stay**
- **1.6 Inpatient mortality**

#### Admission and demographics:

- A significantly higher proportion of adult patients admitted with **asthma attacks** were female (72.5%).
- The **median age** at admission was **50 years** (interquartile range (IQR) 34–65).
- More patients were admitted on **weekdays**, from **late morning to early afternoon** (10am to 2pm). Fewer patients were admitted overnight (10pm to 8am) and on weekends.

#### Length of stay:

- The **median length of stay** for an admission was **3 days**.

#### Inpatient mortality:

- **23 (0.2%)** audited patients admitted for asthma attacks died during their hospital stay.

### 1.1 Age

	2018/19		
Age at arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Median (IQR*)	50 (34 to 65)	50 (34 to 65)	49 (35 to 65)

\*Interquartile range



## 1.2 Gender

Gender	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Male	2,803 (27.4%)	2,653 (27.4%)	128 (28.7%)
Female	7,424 (72.5%)	7,032 (72.5%)	318 (71.3%)
Transgender	5 (0.0%)	5 (0.1%)	0 (0.0%)
Other	0 (0.0%)	0 (0.0%)	0 (0.0%)
Not recorded/ preferred not to say	10 (0.1%)	10 (0.1%)	0 (0.0%)

## 1.3 Socioeconomic status

### 1.3.1 Index of Multiple Deprivation (IMD) measures by national quintile in England and Wales

		% of audit sample living in each quintile of English or Welsh Index of Multiple Deprivation				
Index of Multiple Deprivation		Q1 (Most deprived)	Q2	Q3	Q4	Q5 (Least deprived)
2018 /19	England (IMD*) (N=9,505)	2,829 (29.8%)	2,136 (22.5%)	1,834 (19.3%)	1,468 (15.4%)	1,238 (13.0%)
	Wales (WIMD**) (N=447)	127 (28.4%)	84 (18.8%)	94 (21.0%)	52 (11.6%)	90 (20.1%)

\*Index of Multiple Deprivation, England \*\*Welsh Index of Multiple Deprivation

- Please note when reviewing these data that indices of multiple deprivation are not directly comparable between England and Wales.

**Fig 1. Percentage of the audit cohort in each IMD quintile in England and Wales**





## 1.4 Arrival at hospital

### 1.4.1 Median number of admissions per hospital

	2018/19		
Number of admissions	All (N=10,242)	England (N=9,700)	Wales (N=446)
Median (IQR)	52 (28 to 83)	56 (32 to 88)	27 (14 to 38)

### 1.4.2 Day and time of arrival at hospital (All)

	Day patient arrived (N=10,242)						
Time of arrival	Monday (N=1,767)	Tuesday (N=1,476)	Wednesday (N=1,552)	Thursday (N=1,552)	Friday (N=1,401)	Saturday (N=1,169)	Sunday (N=1,325)
00.00–01.59	77 (4.4%)	49 (3.3%)	71 (4.6%)	75 (4.8%)	72 (5.1%)	66 (5.6%)	80 (6.0%)
02.00–03.59	79 (4.5%)	44 (3.0%)	58 (3.7%)	50 (3.2%)	42 (3.0%)	56 (4.8%)	64 (4.8%)
04.00–05.59	63 (3.6%)	52 (3.5%)	47 (3.0%)	39 (2.5%)	35 (2.5%)	54 (4.6%)	60 (4.5%)
06.00–07.59	70 (4.0%)	57 (3.9%)	50 (3.2%)	53 (3.4%)	46 (3.3%)	57 (4.9%)	69 (5.2%)
08.00–09.59	138 (7.8%)	105 (7.1%)	96 (6.2%)	103 (6.6%)	103 (7.4%)	83 (7.1%)	103 (7.8%)
10.00–11.59	276 (15.6%)	217 (14.7%)	217 (14.0%)	229 (14.8%)	229 (16.3%)	122 (10.4%)	148 (11.2%)
12.00–13.59	260 (14.7%)	212 (14.4%)	234 (15.1%)	200 (12.9%)	196 (14.0%)	152 (13.0%)	161 (12.2%)
14.00–15.59	187 (10.6%)	160 (10.8%)	182 (11.7%)	204 (13.1%)	152 (10.8%)	107 (9.2%)	121 (9.1%)
16.00–17.59	212 (12.0%)	191 (12.9%)	167 (10.8%)	181 (11.7%)	154 (11.0%)	129 (11.0%)	140 (10.6%)
18.00–19.59	194 (11.0%)	152 (10.3%)	172 (11.1%)	171 (11.0%)	162 (11.6%)	115 (9.8%)	123 (9.3%)
20.00–21.59	113 (6.4%)	128 (8.7%)	149 (9.6%)	146 (9.4%)	129 (9.2%)	118 (10.1%)	132 (10.0%)
22.00–23.59	98 (5.5%)	109 (7.4%)	109 (7.0%)	101 (6.5%)	81 (5.8%)	110 (9.4%)	124 (9.4%)

#### Key

Lowest (2.5%)

Highest (16.3%)

- Please note that for this table, red boxes denote the times when arrival activity was highest, while green boxes denote the times when arrival activity was lowest.

**1.5 Length of stay<sup>a</sup>**

	2018/19		
Length of stay, days	All (N=10,219)	England (N=9,679)	Wales (N=445)
Median (IQR)	3 (1 to 5)	3 (1 to 5)	2 (1 to 5)

**1.6 Inpatient mortality**

	2018/19		
Patients discharged	All (N=10,242)	England (N=9,700)	Wales (N=446)
Inpatient deaths	23 (0.2%)	21 (0.2%)	1 (0.2%)

- Please note that these audit data are based on a sample of all patients who were eligible for inclusion in this round of analysis. Therefore, these data (Table 1.6) do not provide a representative picture of the full number of asthma deaths that occurred during the audit data collection period.

<sup>a</sup> The denominator excludes patients who died as inpatients.



## Section 2: Smoking

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### Key standards:

- [BTS/SIGN 2019 \[6.2.3\]](#): People with asthma and parents/carers of children with asthma should be advised about the dangers of smoking and second-hand tobacco smoke exposure, and should be offered appropriate support to stop smoking.<sup>1</sup>
- [NICE 2013 QS43 \[QS1\]](#): People should be asked if they smoke by their healthcare practitioner, and those who smoke should be offered advice on how to stop.<sup>2</sup>
- [NRAD 2014 \[Patient factors and perception of risk – recommendation 2\]](#): A history of smoking and/or exposure to second-hand smoke should be documented in the medical records of all people with asthma. Current smokers should be offered referral to a smoking cessation service.<sup>3</sup>

### Audit results:

- **20.7%** of patients admitted for asthma attacks were **recorded as current smokers**. 22.8% of patients admitted were ex-smokers and 46.9% of patients had never smoked.
- **59.2% of current smokers** had their **tobacco dependency addressed** prior to discharge.<sup>b</sup>

## 2.1 Smoking status

Smoking status	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Never smoked	4,801 (46.9%)	4,549 (46.9%)	200 (44.8%)
Ex-smoker	2,340 (22.8%)	2,203 (22.7%)	104 (23.3%)
Current smoker	2,122 (20.7%)	2,009 (20.7%)	104 (23.3%)
Ex-smoker and current vaper	71 (0.7%)	65 (0.7%)	5 (1.1%)
Never smoked and current vaper	24 (0.2%)	23 (0.2%)	1 (0.2%)
Not recorded	884 (8.6%)	851 (8.8%)	32 (7.2%)

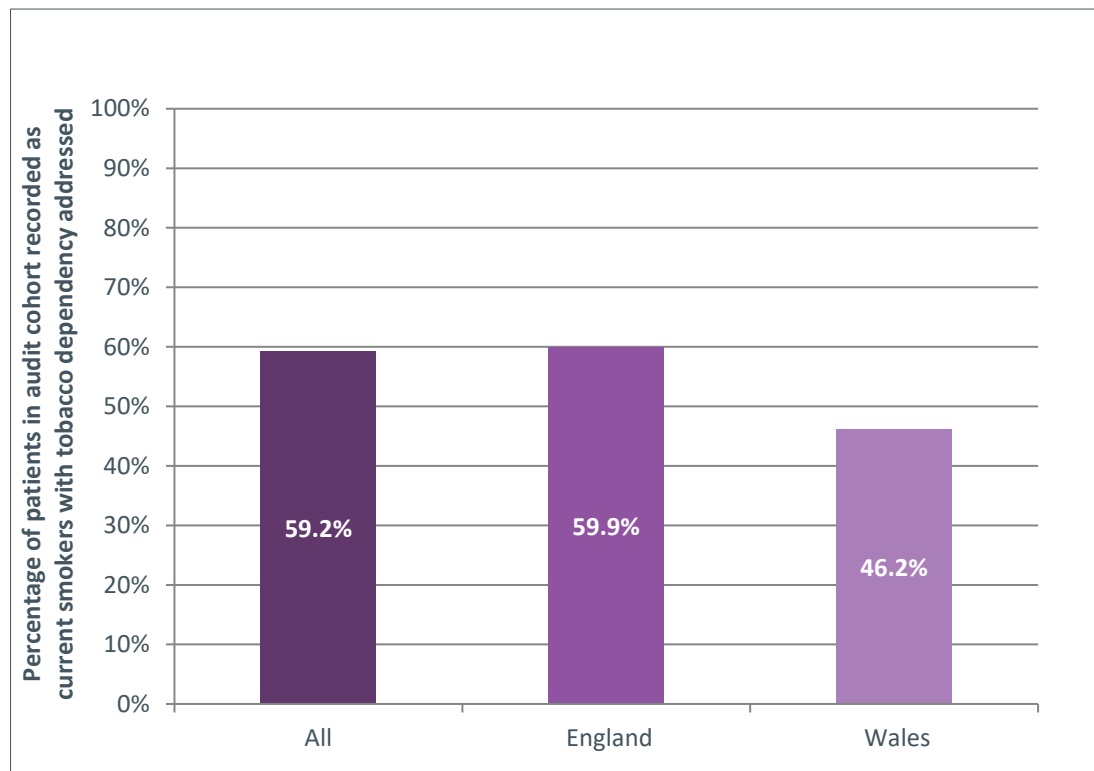
## 2.2 Current smokers with tobacco dependency addressed<sup>b, c</sup>

	2018/19		
	All (N=2,121)	England (N=2,008)	Wales (N=104)
Tobacco dependency addressed	1,256 (59.2%)	1,203 (59.9%)	48 (46.2%)

<sup>b</sup> Addressing tobacco dependency includes identifying patients who smoke on admission and offering and/or prescribing smoking cessation advice and/or pharmacotherapy.

<sup>c</sup> The denominator for this metric is based on the number of current smokers identified in Table 2.1. Please note that the definition of current smoker for the purposes of the audit includes smokers of cannabis and heroin.

**Fig 2. Percentage of patients in audit cohort who were current smokers with tobacco dependency addressed**





## Section 3: Acute observations

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### Navigation

*This section contains the following tables and graphs. If you are viewing this report on an electronic device, you can select the table that you wish to see from the list below.*

- **3.1 Baseline observations**
  - 3.1.1 Heart rate
    - 3.1.1a What was the first recorded heart rate for the patient following arrival at hospital?
  - 3.1.2 Respiratory rate
    - 3.1.2a What was the first recorded respiratory rate for the patient following arrival at hospital?
  - 3.1.3 Oxygen saturation (SpO<sub>2</sub>)
    - 3.1.3a Did the patient have an SpO<sub>2</sub> measurement taken following arrival at hospital?
    - 3.1.3b What was the first recorded SpO<sub>2</sub> measurement for the patient following arrival at hospital?
    - 3.1.3c Was the measurement taken while the patient was on supplementary oxygen?
- **3.2 Peak expiratory flow (PEF)**
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  - 3.2.6 Did the patient have a previous best PEF?
  - 3.2.7 If previous best PEF was not known, did the patient have a predicted PEF calculated?
  - 3.2.8 Number of patients with a record of either previous PEF or predicted PEF, if PEF measurement taken following arrival
  - 3.2.9 PEF on admission as a percentage of best PEF or predicted PEF

### 3.1. Baseline observations

#### Key standards – baseline observations:

- [NICE 2013 QS25 \[QS7\]](#): People with asthma who present with an exacerbation of their symptoms receive an objective measurement of severity at the time of presentation.<sup>4</sup>

**Audit results – baseline observations:**

- The median values for first recorded observations were as follows:
  - Heart rate of **102 bpm**
  - Respiratory rate of **22 bpm**
  - SpO<sub>2</sub> measurement of **96%** (this measurement was taken while patients were on room air in 73.9% of cases)

**3.1.1 Heart rate****3.1.1a What was the first recorded heart rate for the patient following arrival at hospital?**

	2018/19		
Heart rate on arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Median (IQR)	102 (89 to 117)	102 (89 to 117)	102 (89 to 114)

**3.1.2 Respiratory rate****3.1.2a What was the first recorded respiratory rate for the patient following arrival at hospital?**

	2018/19		
Respiratory rate on arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Median (IQR)	22 (20 to 26)	22 (20 to 26)	22 (20 to 25)

**3.1.3 Oxygen saturation (SpO<sub>2</sub>)****3.1.3a Did the patient have an SpO<sub>2</sub> measurement taken following arrival at hospital?**

	2018/19		
SpO <sub>2</sub> on arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	10,159 (99.2%)	9,619 (99.2%)	445 (99.8%)
Not recorded	83 (0.8%)	81 (0.8%)	1 (0.2%)

**3.1.3b What was the first recorded SpO<sub>2</sub> measurement for the patient following arrival at hospital?**

	2018/19		
SpO <sub>2</sub> (%) on arrival	All (N=10,159)	England (N=9,619)	Wales (N=445)
Median (IQR)	96% (94% to 98%)	96% (94% to 98%)	96% (94% to 98%)

**3.1.3c Was the measurement taken while the patient was on supplementary oxygen?**

SpO <sub>2</sub> while on supplementary oxygen	2018/19		
	All (N=10,159)	England (N=9,619)	Wales (N=445)
Yes	2,048 (20.2%)	1,955 (20.3%)	69 (15.5%)
No, room air	7,510 (73.9%)	7,101 (73.8%)	341 (76.6%)
Not recorded	601 (5.9%)	563 (5.9%)	35 (7.9%)

**3.2 Peak expiratory flow (PEF)****Key standards – PEF:**

- [BTS/SIGN 2019 \[9.2.3\]](#): Measurements of airway calibre improve recognition of the degree of severity, the appropriateness or intensity of therapy, and decisions about management in hospital or at home. PEF or FEV<sub>1</sub> (forced expiratory volume in 1 second) are useful and valid measures of airway calibre. PEF is more convenient in the acute situation.<sup>1</sup>
- [BTS/SIGN 2019 \[9.2.6\]](#): Patients whose PEF is greater than 75% best or predicted 1 hour after initial treatment may be discharged from the ED unless they meet any of the following criteria, when admission may be appropriate: still have significant symptoms; concerns about adherence; living alone/socially isolated; psychological problems; physical disability or learning difficulties; previous near-fatal asthma attack; asthma attack despite adequate dose of oral corticosteroid prior to presentation; presentation at night; pregnancy.<sup>1</sup>
- [NICE 2013 QS25 \[QS7\]](#): People with asthma who present with an exacerbation of their symptoms receive an objective measurement of severity at the time of presentation.<sup>4</sup>

**Audit results – PEF:**

- **72.6%** of patients had a **recorded PEF measurement** while 23.5% had no PEF measurement recorded during their admission and 3.9% of patients were too unwell to have a measurement taken.
- The **median time to PEF measurement** following arrival at hospital was **4 hours** (IQR 1–16 hours).
- **27.9%** of all patients with a PEF measurement, and a time for their measurement, had PEF taken **within 1 hour of arrival**.
- **52.8%** of all patients with a PEF measurement, and a time for their measurement, had PEF taken **within 4 hours of arrival**.
- **58.7%** of patients had a **previous best PEF recorded**. Where a previous best PEF was not recorded, **33.4%** of admissions had a **predicted PEF recorded**.
- Of the patients who had a recorded PEF measurement taken, **84.7%** had a **record of either previous or predicted PEF**.
- The **median PEF on admission** as a percentage of previous best PEF or predicted PEF was **60.0%** (IQR 45.5–75.0%).



- **74.3%** of patients who had a PEF measurement taken and a measurement for either best/predicted PEF had a **PEF measurement of less than 75% as a percentage of best/predicted PEF** following arrival.

### 3.2.1 Did the patient have a PEF measurement following arrival at hospital?<sup>d</sup>

	2018/19		
PEF on arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	7,436 (72.6%)	6,995 (72.1%)	372 (83.4%)
Patient too unwell	395 (3.9%)	388 (4.0%)	7 (1.6%)
Not recorded	2,411 (23.5%)	2,317 (23.9%)	67 (15.0%)

### 3.2.2 Median time, in hours, from arrival at hospital to PEF measurement<sup>e</sup>

	2018/19		
Median time to PEF measurement	All (N=6,441)	England (N=6,070)	Wales (N=323)
Median (IQR)	4 (1 to 16)	4 (1 to 16)	3 (1 to 13)

### 3.2.3 Number of patients with a PEF measurement taken within 1 hour of arrival at hospital<sup>e</sup>

	2018/19		
Time to PEF	All (N=6,441)	England (N=6,070)	Wales (N=323)
PEF taken within 1 hour	1,797 (27.9%)	1,682 (27.7%)	98 (30.3%)

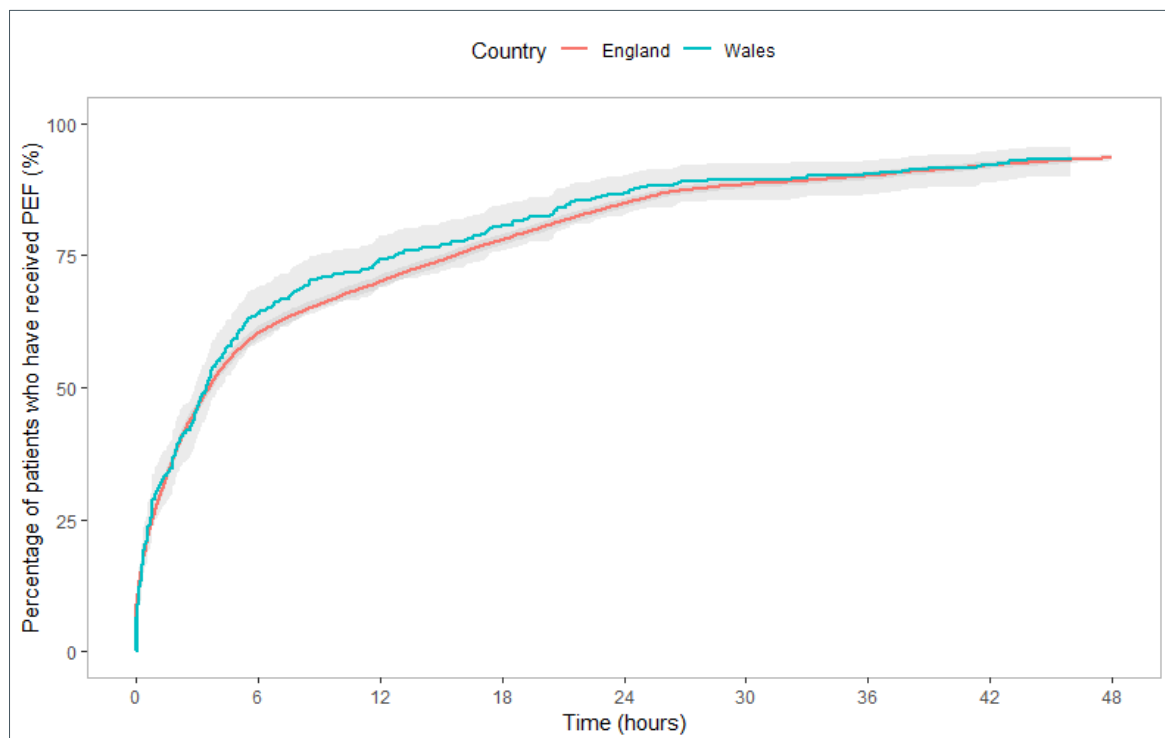
### 3.2.4 Number of patients with a PEF measurement taken within 4 hours of arrival at hospital<sup>e</sup>

	2018/19		
Time to PEF	All (N=6,441)	England (N=6,070)	Wales (N=323)
PEF taken within 4 hours	3,398 (52.8%)	3,190 (52.6%)	178 (55.1%)

<sup>d</sup> The exact wording of the question in the clinical audit dataset was: *What was the first recorded peak expiratory flow measurement (PEF) for the patient following arrival at hospital?*

<sup>e</sup> Only records with a recorded date and time to PEF measurement were included in this analysis.

**Fig 3. Cumulative percentage of patients who received a PEF measurement following arrival at hospital**



3.2.5 Percentage of patients with a PEF measurement by day and time of arrival<sup>f</sup>

Time of arrival	Day of arrival (N=10,242)						
	Monday (N=1,287)	Tuesday (N=1,095)	Wednesday (N=1,153)	Thursday (N=1,119)	Friday (N=1,009)	Saturday (N=816)	Sunday (N=957)
00.00–01.59	53 (68.8%)	32 (65.3%)	52 (73.2%)	53 (70.7%)	50 (69.4%)	43 (65.2%)	57 (71.2%)
02.00–03.59	60 (75.9%)	31 (70.5%)	41 (70.7%)	37 (74.0%)	33 (78.6%)	35 (62.5%)	47 (73.4%)
04.00–05.59	46 (73.0%)	36 (69.2%)	35 (74.5%)	25 (64.1%)	24 (68.6%)	36 (66.7%)	39 (65.0%)
06.00–07.59	55 (78.6%)	39 (68.4%)	39 (78.0%)	41 (77.4%)	36 (78.3%)	45 (78.9%)	49 (71.0%)
08.00–09.59	109 (79.0%)	75 (71.4%)	72 (75.0%)	73 (70.9%)	74 (71.8%)	56 (67.5%)	70 (68.0%)
10.00–11.59	208 (75.4%)	171 (78.8%)	164 (75.6%)	165 (72.1%)	166 (72.5%)	89 (73.0%)	98 (66.2%)
12.00–13.59	185 (71.2%)	169 (79.7%)	185 (79.1%)	148 (74.0%)	146 (74.5%)	106 (69.7%)	120 (74.5%)
14.00–15.59	121 (64.7%)	113 (70.6%)	133 (73.1%)	143 (70.1%)	113 (74.3%)	78 (72.9%)	89 (73.6%)
16.00–17.59	148 (69.8%)	143 (74.9%)	117 (70.1%)	135 (74.6%)	113 (73.4%)	85 (65.9%)	101 (72.1%)
18.00–19.59	152 (78.4%)	118 (77.6%)	131 (76.2%)	124 (72.5%)	109 (67.3%)	79 (68.7%)	87 (70.7%)
20.00–21.59	78 (69.0%)	93 (72.7%)	101 (67.8%)	102 (69.9%)	92 (71.3%)	87 (73.7%)	103 (78.0%)
22.00–23.59	72 (73.5%)	75 (68.8%)	83 (76.1%)	73 (72.3%)	53 (65.4%)	77 (70.0%)	97 (78.2%)

## Key

Lowest (62.5%)

Highest (79.7%)

- Please note that for this table, red boxes denote the times when a patient was least likely to have a PEF measurement taken following arrival at hospital, while green boxes denote the times when a patient was most likely to have a PEF measurement taken following arrival at hospital.

3.2.6 Did the patient have a previous best PEF?<sup>g</sup>

Previous best PEF	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	6,008 (58.7%)	5,715 (58.9%)	241 (54.0%)

<sup>f</sup> Only records with a recorded date and time of PEF measurement were included in this analysis.<sup>g</sup> The exact wording of the question in the clinical audit dataset was: *What was the patient's previous best PEF?*

**3.2.7 If previous best PEF was not recorded, did the patient have a predicted PEF calculated?<sup>h</sup>**

	2018/19		
Predicted PEF	All (N=4,234)	England (N=3,985)	Wales (N=205)
Yes	1,416 (33.4%)	1,367 (34.3%)	32 (15.6%)

**3.2.8 Number of patients with a record of either previous PEF or predicted PEF, if PEF measurement taken following arrival**

	2018/19		
Previous best or predicted PEF recorded	All (N=7,436)	England All (N=6,995)	Wales All (N=372)
Recorded	6,295 (84.7%)	5,976 (85.4%)	259 (69.6%)

**3.2.9 PEF recorded on admission as a percentage of best PEF or predicted PEF**

	2018/19		
PEF recorded on admission as a percentage of best/ predicted PEF	All (N=6,295)	England (N=5,976)	Wales (N=259)
Median % predicted PEF (IQR)	60.0% (45.5% to 75.0%)	59.5% (45.2% to 75.0%)	62.2% (47.7% to 77.8%)
Admitted with PEF <75%	4,679 (74.3%)	4,451 (74.5%)	186 (71.8%)

<sup>h</sup> The exact wording of the question in the clinical audit dataset was: *If previous best PEF = 'Not recorded' please give predicted PEF.*



## Section 4: Acute treatment

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- **4.1 Respiratory specialist review**
  - 4.1.1 Was the patient reviewed by a respiratory specialist during their admission?
  - 4.1.2 Median time, in hours, from arrival at hospital to review by a respiratory specialist
  - 4.1.3 Number of patients with a specialist respiratory review within 24 hours of arrival at hospital
- **4.2 Oxygen prescription and administration**
  - 4.2.1 Was oxygen prescribed/administered for the patient at any point during admission?
- **4.3 Systemic steroids (oral and IV) and  $\beta_2$  agonists**
  - 4.3.1a Was the patient administered systemic steroids following arrival at hospital?
  - 4.3.1b Median time, in hours, from arrival at hospital to administration of systemic steroids
  - 4.3.1c Number of patients receiving systemic steroids within 1 hour of arrival at hospital
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  - 4.3.2d Number of patients receiving  $\beta_2$  agonists within 4 hours of arrival at hospital

### 4.1 Respiratory specialist review

#### Key standards – respiratory review:

- [NICE 2013 QS25 \[QS9\]](#): People admitted to hospital with an acute exacerbation of asthma have a structured review by a member of a specialist respiratory team before discharge.<sup>4</sup>

#### Audit results – respiratory review:

- Patients were judged to have had a respiratory specialist review if they were seen by any member of the respiratory multidisciplinary team with training and skills in care of patients with asthma. **76.8%** of patients were **reviewed by a respiratory specialist** at some point during their admission.
- The **median time to respiratory specialist review** was **20 hours** (IQR 11–36 hours).
- **61.8%** of patients who received a respiratory specialist review were **reviewed within 24 hours** of arrival at hospital.

**4.1.1 Was the patient reviewed by a respiratory specialist during their admission?**

	2018/19		
Respiratory specialist review	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	7,870 (76.8%)	7,518 (77.5%)	274 (61.4%)

**4.1.2 Median time, in hours, from arrival at hospital to review by a respiratory specialist**

	2018/19		
Median time to review by respiratory specialist	All (N=7,870)	England (N=7,518)	Wales (N=274)
Median (IQR)	20 (11 to 36)	20 (11 to 36)	21 (11 to 44)

**4.1.3 Number of patients with a specialist respiratory review within 24 hours of arrival at hospital**

	2018/19		
	All (N=7,870)	England (N=7,518)	Wales (N=274)
Specialist respiratory review within 24 hours	4,862 (61.8%)	4,656 (61.9%)	156 (56.9%)

**4.2 Oxygen prescription and administration****Key standards – oxygen prescription and administration:**

- [BTS 2017 \[Guideline for oxygen use in healthcare and emergency settings\]](#): Every healthcare facility should have a standard oxygen prescription document or, preferably, a designated oxygen section on all drug-prescribing cards or guided prescription of oxygen in electronic prescribing systems.<sup>5</sup>
- [BTS 2017 \[Guideline for oxygen use in healthcare and emergency settings\]](#): A prescription for oxygen should always be provided, except in sudden illness when it must be started immediately and documented retrospectively.<sup>5</sup>

**Audit results – oxygen prescription and administration:**

- Oxygen should be prescribed to ensure patients are managed safely. However, the audit data shows **16.8%** of patients were administered oxygen **without a prescription**.

#### 4.2.1 Was oxygen prescribed for/administered to the patient at any point during admission?

Oxygen prescription and administration	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Prescribed only	1,752 (17.1%)	1,659 (17.1%)	79 (17.7%)
Administered only	1,720 (16.8%)	1,640 (16.9%)	62 (13.9%)
Prescribed and administered	2,325 (22.7%)	2,211 (22.8%)	89 (20.0%)
No	4,445 (43.4%)	4,190 (43.2%)	216 (48.4%)

#### 4.3 Systemic steroids (oral and IV) and $\beta_2$ agonists

##### Key standards – systemic steroids:

- [BTS/SIGN 2019 \[2.7.1, 9.3.3\]](#): Give steroids in adequate doses to all patients with an acute asthma attack.<sup>1</sup>
- [NICE 2013 QS25 \[QS8\]](#): People aged 5 years or older presenting to a healthcare professional with a severe or life-threatening acute exacerbation of asthma receive oral or intravenous steroids within 1 hour of presentation.<sup>4</sup>

##### Key standards – $\beta_2$ agonists:

- [BTS/SIGN 2019 \[2.7.1, 9.3.2\]](#): Use high-dose inhaled  $\beta_2$  agonists as first-line agents in patients with acute asthma and administer as early as possible. Reserve intravenous  $\beta_2$  agonists for those patients in whom inhaled therapy cannot be used reliably.<sup>1</sup>

##### Audit results – systemic steroids:

- **87.7%** of patients were administered systemic steroids following arrival at hospital.
- **31.2%** of all patients who received systemic steroids as an inpatient received these **within 1 hour** of arrival at hospital.
- **65.3%** of all patients who received systemic steroids were administered these **within 4 hours** of arrival at hospital.

##### Audit results – $\beta_2$ agonists:

- **42.2%** of all patients who received  $\beta_2$  agonists as an inpatient received these **within 1 hour** of arrival at hospital.

##### Caveats to systemic steroids and $\beta_2$ agonists audit data:

- The audit dataset does not record pre-hospital care so it is possible that some patients received their first dose of systemic steroids and  $\beta_2$  agonists in primary care or in the ambulance.
- Data on administration of systemic steroids and  $\beta_2$  agonists in the first 4 hours of hospital admission should be interpreted with the above caveat.
- Early administration of systemic steroids is associated with better outcomes.<sup>6</sup> Therefore it is our intention to add a question to the pending revision of the audit dataset on pre-hospital care. This will allow us to examine attainment against timely treatment for asthma attacks on arrival to hospital with greater detail in future reports.



**4.3.1a Was the patient administered systemic steroids following arrival at hospital?**

	2018/19		
Systemic steroids on arrival	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	8,986 (87.7%)	8,532 (88.0%)	377 (84.5%)
Not administered	694 (6.8%)	651 (6.7%)	30 (6.7%)
Not recorded	562 (5.5%)	517 (5.3%)	39 (8.7%)

**4.3.1b Median time, in hours, from arrival at hospital to administration of systemic steroids**

	2018/19		
Median time, in hours, from arrival to administration of systemic steroids	All (N=8,986)	England (N=8,532)	Wales (N=377)
Median (IQR)	2 (1 to 7)	2 (1 to 7)	3 (1 to 9)

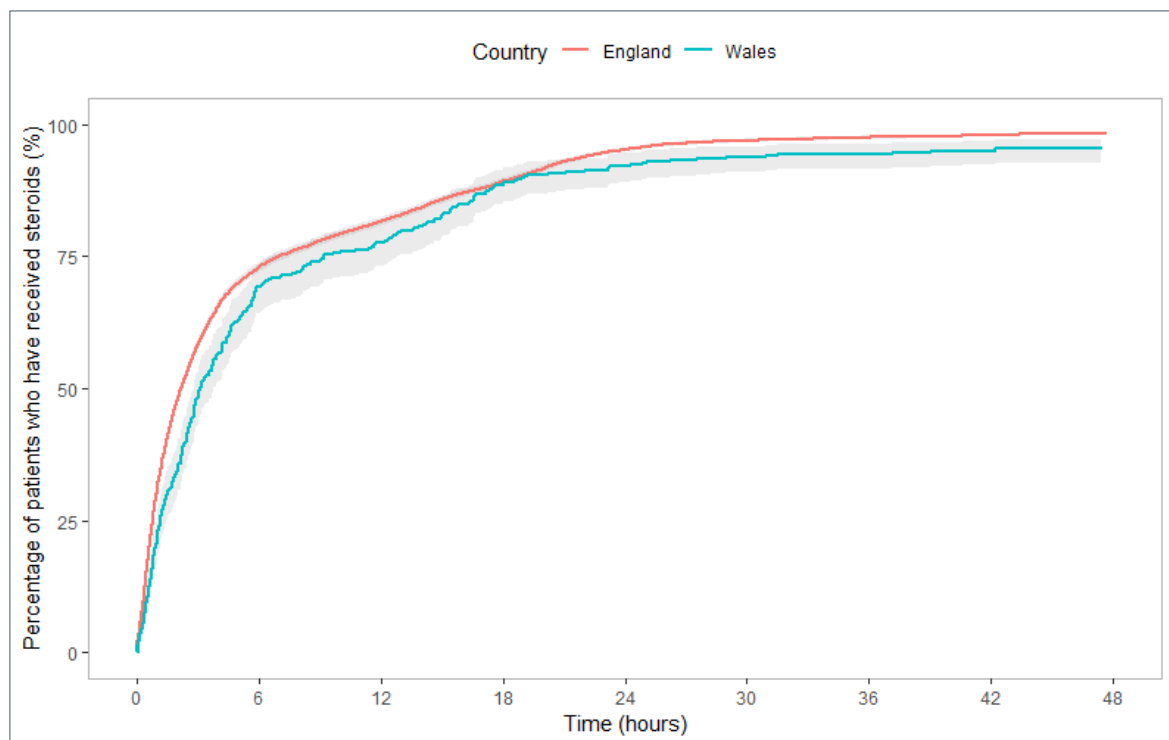
**4.3.1c Number of patients receiving systemic steroids within 1 hour of arrival at hospital**

	2018/19		
Systemic steroids within 1 hour	All (N=8,986)	England All (N=8,532)	Wales All (N=377)
Received within 1 hour	2,808 (31.2%)	2,700 (31.6%)	85 (22.5%)

**4.3.1d Number of patients receiving systemic steroids within 4 hours of arrival at hospital**

	2018/19		
Systemic steroids within 4 hours	All (N=8,986)	England (N=8,532)	Wales (N=377)
Received within 4 hours	5,870 (65.3%)	5,606 (65.7%)	214 (56.8%)

**Fig 4. Cumulative percentage of patients who received systemic steroids following arrival at hospital**



#### 4.3.1e Percentage of patients who received systemic steroids within 4 hours by day and time of arrival

Time of arrival	Day of arrival (N=5,870)						
	Monday (N=1,014)	Tuesday (N=848)	Wednesday (N=873)	Thursday (N=871)	Friday (N=783)	Saturday (N=672)	Sunday (N=809)
00.00–01.59	49 (63.6%)	24 (49.0%)	36 (50.7%)	41 (54.7%)	42 (58.3%)	30 (45.5%)	43 (53.8%)
02.00–03.59	46 (58.2%)	28 (63.6%)	27 (46.6%)	28 (56.0%)	29 (69.0%)	35 (62.5%)	38 (59.4%)
04.00–05.59	53 (84.1%)	35 (67.3%)	32 (68.1%)	27 (69.2%)	23 (65.7%)	36 (66.7%)	38 (63.3%)
06.00–07.59	50 (71.4%)	38 (66.7%)	39 (78.0%)	38 (71.7%)	31 (67.4%)	37 (64.9%)	44 (63.8%)
08.00–09.59	93 (67.4%)	66 (62.9%)	65 (67.7%)	71 (68.9%)	71 (68.9%)	52 (62.7%)	71 (68.9%)
10.00–11.59	156 (56.5%)	141 (65.0%)	133 (61.3%)	115 (50.2%)	134 (58.5%)	67 (54.9%)	92 (62.2%)
12.00–13.59	138 (53.1%)	115 (54.2%)	117 (50.0%)	111 (55.5%)	105 (53.6%)	88 (57.9%)	98 (60.9%)
14.00–15.59	99 (52.9%)	75 (46.9%)	95 (52.2%)	109 (53.4%)	86 (56.6%)	55 (51.4%)	80 (66.1%)
16.00–17.59	111 (52.4%)	107 (56.0%)	98 (58.7%)	97 (53.6%)	69 (44.8%)	70 (54.3%)	77 (55.0%)
18.00–19.59	103 (53.1%)	81 (53.3%)	91 (52.9%)	90 (52.6%)	86 (53.1%)	66 (57.4%)	75 (61.0%)
20.00–21.59	62 (54.9%)	80 (62.5%)	74 (49.7%)	86 (58.9%)	62 (48.1%)	73 (61.9%)	83 (62.9%)
22.00–23.59	54 (55.1%)	58 (53.2%)	66 (60.6%)	58 (57.4%)	45 (55.6%)	63 (57.3%)	70 (56.5%)

#### Key

Lowest (44.8%)

Highest (84.1%)

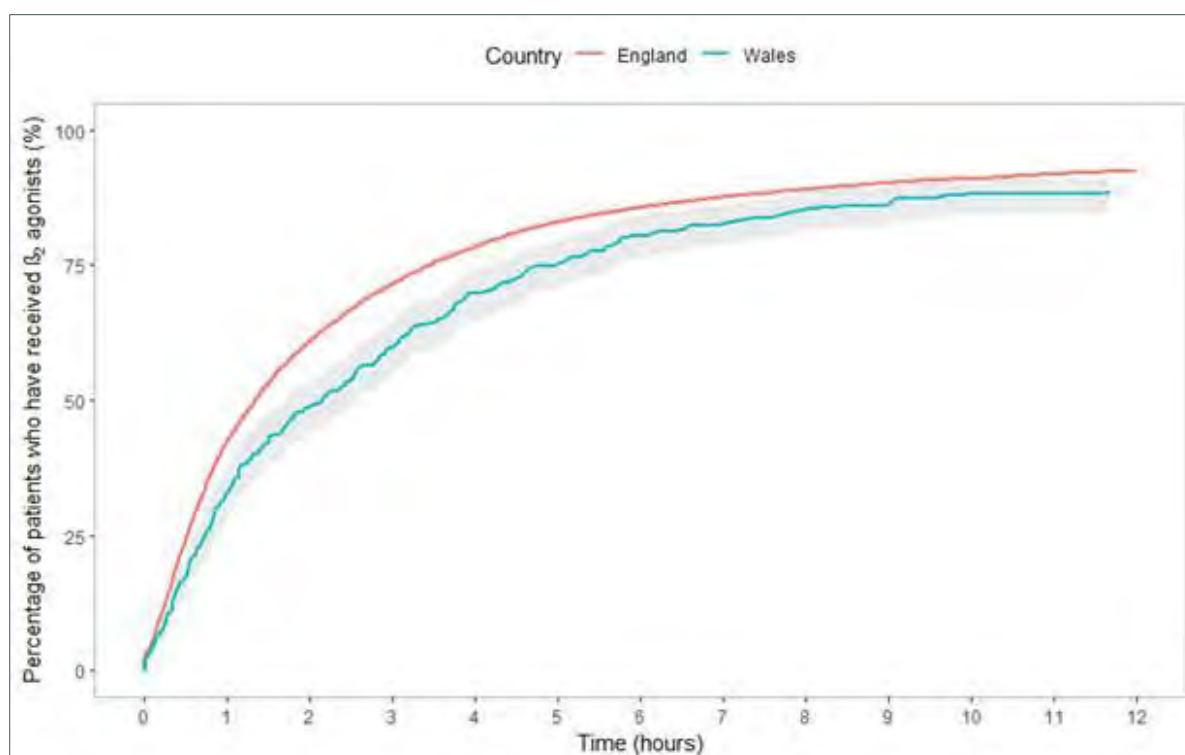
- Please note that for this table, red boxes denote the times when a patient was least likely to receive systemic steroids within 4 hours of arrival at hospital, while green boxes denote the times when a patient was most likely to receive systemic steroids within 4 hours of arrival at hospital.

#### 4.3.2a Was the patient administered $\beta_2$ agonists following arrival at hospital?

$\beta_2$ agonists on arrival	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Yes	9,346 (91.3%)	8,865 (91.4%)	396 (88.8%)
Not recorded	488 (4.8%)	452 (4.7%)	34 (7.6%)
Not administered	408 (4.0%)	383 (3.9%)	16 (3.6%)

**4.3.2b Median time, in minutes, from arrival at hospital to administration of  $\beta_2$  agonists**

	2018/19		
Median time, in minutes, from arrival to administration of $\beta_2$ agonists	All (N=9,346)	England (N=8,865)	Wales (N=396)
Median (IQR)	82 (31 to 210)	80 (31 to 207)	129 (44 to 299)

**Fig 5. Cumulative percentage of patients who received  $\beta_2$  agonists following arrival at hospital****4.3.2c Number of patients receiving  $\beta_2$  agonists within 1 hour of arrival at hospital**

	2018/19		
$\beta_2$ agonists within 1 hour	All (N=9,346)	England All (N=8,865)	Wales All (N=396)
Received within 1 hour	3,941 (42.2%)	3,772 (42.5%)	131 (33.1%)

**4.3.2d Number of patients receiving  $\beta_2$  agonists within 4 hours of arrival at hospital**

	2018/19		
$\beta_2$ agonists within 4 hours	All (N=9,346)	England All (N=8,865)	Wales All (N=396)
Received within 4 hours	7,306 (78.2%)	6,958 (78.5%)	276 (69.7%)



## Section 5: Review and discharge

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### Navigation

*This section contains the following tables and graphs. If you are viewing this report on an electronic device, you can select the table that you wish to see from the list below.*

- **5.1 Day of discharge**
- **5.2 Discharge bundles**
  - 5.2.1 Was a discharge bundle completed for this admission?
  - 5.2.2 What elements of good practice care were undertaken as part of the patient's discharge?
  - 5.2.3 Number of patients in receipt of all six elements of good practice

#### Key standards – elements of good practice care on discharge:

- [BTS/SIGN 2019 \[5.2.2\]](#): A hospital admission represents a window of opportunity to review self-management skills. No patient should leave hospital without a written personalised asthma action plan.<sup>1</sup>
- [BTS/SIGN 2019 \[5.3.2\]](#): Prior to discharge, inpatients should receive written personalised asthma action plans, given by healthcare professionals with expertise in providing asthma education.<sup>1</sup>
- [BTS/SIGN 2019 \[9.6.2\]](#): Prior to discharge, trained staff should give asthma education. This should include education on inhaler technique and PEF record keeping, with a written PEF and symptom-based personalised asthma action plan (PAAP) being provided allowing the patient to adjust their therapy within recommendations. These measures have been shown to reduce morbidity after the asthma attack and reduce relapse rates.<sup>1</sup>
- [BTS/SIGN 2019 \[9.6.3\]](#): A careful history should elicit the reasons for the asthma attack and explore possible actions the patient should take to prevent future emergency presentations. Medication should be altered depending upon the assessment and the patient provided with an asthma action plan aimed at preventing relapse, optimising treatment and preventing delay in seeking assistance in the future.<sup>1</sup>
- [BTS/SIGN 2019 \[9.6.3\]](#): Prior to discharge, follow up should be arranged with the patient's general practitioner or asthma nurse within 2 working days and with a hospital specialist asthma nurse or respiratory physician at about 1 month after admission.<sup>1</sup>
- [NICE 2018 QS25 \[QS4\]](#): People who receive treatment in an emergency care setting for an asthma attack are followed up by their general practice within 2 working days of discharge.<sup>4</sup>
- [NICE 2018 QS25 \[QS5\]](#): People with suspected severe asthma are referred to a specialist multidisciplinary severe asthma service.<sup>4</sup>

**Audit results – elements of good practice care on discharge:**

- **48.2%** of patients **received an asthma care bundle**.
- **31.1%** of patients received **all six elements of good practice care**. The six elements were:
  - inhaler technique checked
  - maintenance medication reviewed
  - adherence discussed
  - personalised asthma action plan issued/reviewed
  - tobacco dependency addressed (if a current smoker)
  - follow up (patient provided either: community follow up requested within 2 working days **and/or** specialist review requested within 4 weeks).
- **83.3%** of all patients received **at least one of the elements** of good practice care. This figure includes the elements listed above, also in addition to ‘triggers discussed’ as an option. The figure excludes current smokers who only had tobacco dependency addressed.
- The **least frequently provided** elements of good practice care were:
  - community follow up requested within 2 working days (33.9%)
  - issue/review of a personalised asthma action plan (40.6%).
- The **most frequently provided** elements of good practice care were:
  - inhaler technique checked (58.6%)
  - maintenance medication reviewed (69.9%).

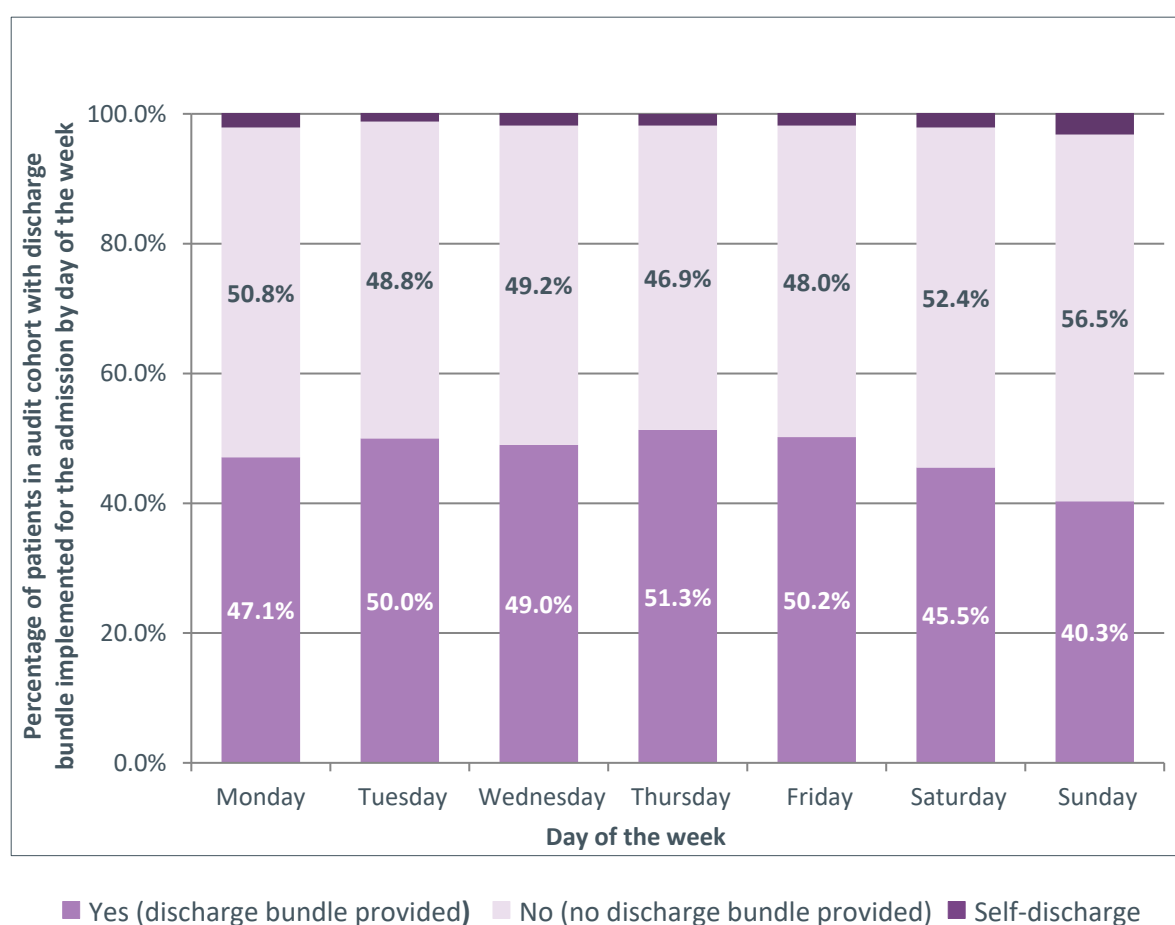
**5.1 Day of discharge<sup>i</sup>**

Day of discharge	2018/19		
	All (N=10,219)	England (N=9,679)	Wales (N=445)
Monday	1,632 (16.0%)	1,535 (15.9%)	84 (18.9%)
Tuesday	1,628 (15.9%)	1,543 (15.9%)	71 (16.0%)
Wednesday	1,561 (15.3%)	1,472 (15.2%)	72 (16.2%)
Thursday	1,605 (15.7%)	1,533 (15.8%)	57 (12.8%)
Friday	1,744 (17.1%)	1,638 (16.9%)	84 (18.9%)
Saturday	1,077 (10.5%)	1,028 (10.6%)	41 (9.2%)
Sunday	972 (9.5%)	930 (9.6%)	36 (8.1%)

**5.2 Discharge bundles****5.2.1 Was a discharge bundle implemented for this admission?<sup>i, j</sup>**

	2018/19		
	All (N=10,219)	England (N=9,679)	Wales (N=445)
Discharge bundle given	4,926 (48.2%)	4,819 (49.8%)	81 (18.2%)

<sup>i</sup> The denominator excludes patients who died as inpatients.<sup>j</sup> The content of asthma care bundles may vary at local level.

**Fig 6. Percentage of patients with a discharge bundle implemented for the admission by day of the week****5.2.2 What elements of good practice care were undertaken as part of the patient's discharge?<sup>k,l</sup>**

	2018/19		
	All (N=10,219)	England (N=9,679)	Wales (N=445)
Inhaler technique checked	5,984 (58.6%)	5,692 (58.8%)	227 (51.0%)
Maintenance medication reviewed	7,139 (69.9%)	6,688 (69.1%)	381 (85.6%)
Adherence discussed	5,408 (52.9%)	5,191 (53.6%)	157 (35.3%)
Personalised asthma action plan (PAAP) issued/reviewed	4,147 (40.6%)	4,049 (41.8%)	61 (13.7%)
Triggers discussed	5,001 (48.9%)	4,833 (49.9%)	129 (29.0%)
Community follow up requested within 2 working days	3,461 (33.9%)	3,349 (34.6%)	66 (14.8%)
Specialist review requested within 4 weeks	5,073 (49.6%)	4,859 (50.2%)	178 (40.0%)
None	1,709 (16.7%)	1,661 (17.2%)	28 (6.3%)

\*Please note that this question followed a tick all that apply format.

<sup>k</sup> Only patients discharged alive, or patients who self-discharged, were included in the denominator.

<sup>l</sup> The analysis excludes current smokers who only had tobacco dependency addressed (N=59).



### 5.2.3 Number of patients in receipt of all six elements of good practice<sup>m</sup>

	2018/19		
	All (N=10,219)	England (N=9,679)	Wales (N=445)
Six elements given ( <i>five given if non-smoker</i> )	3,178 (31.1%)	3,109 (32.1%)	37 (8.3%)
Six elements not given ( <i>five not given if non-smoker</i> )	7,041 (68.9%)	6,570 (67.9%)	408 (91.7%)

<sup>m</sup> The denominator excludes patients who died as inpatients.



## Section 6: Steroids and referral for hospital review

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### Navigation

*This section contains the following tables and graphs. If you are viewing this report on an electronic device, you can select the table that you wish to see from the list below*

- **6.1 Inhaled steroids and oral steroids:**
  - 6.1.1 Was the patient in receipt of inhaled steroids at discharge?
  - 6.1.2 Was the patient prescribed at least 5 days of oral steroids for treatment of their asthma attack?
  - 6.1.3 Has the patient been prescribed more than two courses of oral steroids in the past 12 months?
- **6.2 Referral for hospital assessment**
  - 6.2.1 Was the patient referred for hospital assessment/follow up for asthma?
  - 6.2.2 Number of patients prescribed more than two courses of oral steroids in the past 12 months, who were also referred for hospital assessment/follow up for asthma

### 6.1 Inhaled steroids and oral steroids

#### Key standards – inhaled steroids and oral steroids:

- [BTS/SIGN 2019 \[Management of acute asthma in adults in hospital \(Annex 5\)\]](#): When discharged from hospital, patients should have treatment with oral steroids (prednisolone 40–50 mg until recovery – minimum 5 days) and inhaled steroids in addition to bronchodilators.<sup>1</sup>

#### Audit results – inhaled steroids and oral steroids:

- **89.1%** of patients were prescribed **inhaled steroids at discharge**.
- **90.2%** of patients were prescribed at least **5 days of oral steroids for treatment** of their asthma attack.
- **29.9%** of patients had been prescribed **more than two courses of oral steroids in the past 12 months**.

**6.1.1 Was the patient in receipt of inhaled steroids at discharge?<sup>n</sup>**

	2018/19		
Inhaled steroids at discharge	All (N=10,219)	England (N=9,679)	Wales (N=445)
Yes	9,107 (89.1%)	8,660 (89.5%)	363 (81.6%)
No	1,063 (10.4%)	976 (10.1%)	79 (17.8%)
Not prescribed for medical reasons	49 (0.5%)	43 (0.4%)	3 (0.7%)

**6.1.2 Was the patient prescribed at least 5 days of oral steroids for treatment of their asthma attack?<sup>n</sup>**

	2018/19		
Prescribed at least 5 days of oral steroids	All (N=10,219)	England (N=9,679)	Wales (N=445)
Yes	9,220 (90.2%)	8,761 (90.5%)	381 (85.6%)

**6.1.3 Has the patient been prescribed more than two courses of oral steroids in the past 12 months?<sup>n</sup>**

	2018/19		
Prescribed more than two courses of oral steroids	All (N=10,219)	England (N=9,679)	Wales (N=445)
Yes	3,054 (29.9%)	2,956 (30.5%)	74 (16.6%)
No	4,148 (40.6%)	3,835 (39.6%)	269 (60.4%)
Not recorded	3,017 (29.5%)	2,888 (29.8%)	102 (22.9%)

**6.2 Referral for hospital assessment****Key standards - referral for hospital assessment**

- [BTS/SIGN 2019 \[9.6\]](#): When discharged from hospital, patients should have a follow-up appointment in a respiratory clinic within 4 weeks.<sup>1</sup>
- [NRAD 2014 \[Organisation of NHS services – recommendation 2\]](#): Patients with asthma must be referred to a specialist asthma service if they have required more than two courses of systemic corticosteroids, oral or injected, in the previous 12 months or require management using British Thoracic Society (BTS) stepwise treatment 4 or 5 to achieve control.<sup>3</sup>
- [NRAD 2014 \[Organisation of NHS services – recommendation 3\]](#): Secondary care follow-up should be arranged after every hospital admission for asthma [...].<sup>3</sup>

<sup>n</sup> The denominator excludes patients who died as inpatients.

**Audit results – referral for hospital assessment:**

- **55.8%** of patients were **referred for hospital assessment / follow up**. A further **12.2%** of patients were **already being seen** in a secondary care clinic.

**Audit results – oral steroids history and referral for hospital assessment:**

- Where patients were **prescribed more than two courses of oral steroids in the previous 12 months**, 58.1% were referred for hospital assessment / follow up and 25.3% of patients were recorded as already being seen in secondary care clinic.
- **12.6%** of patients **prescribed more than two courses of oral steroids in the past 12 months** were **not referred for hospital assessment / follow up**.

**6.2.1 Was the patient referred for hospital assessment/follow up for asthma?<sup>o</sup>**

Referral for hospital assessment/follow up	2018/19		
	All (N=10,219)	England (N=9,679)	Wales (N=445)
Yes	5,702 (55.8%)	5,402 (55.8%)	254 (57.1%)
No	2,604 (25.5%)	2,451 (25.3%)	141 (31.7%)
Not recorded	527 (5.2%)	477 (4.9%)	28 (6.3%)
Patient declined	138 (1.4%)	131 (1.4%)	7 (1.6%)
Already being seen in secondary care clinic	1,248 (12.2%)	1,218 (12.6%)	15 (3.4%)

**6.2.2 Number of patients prescribed more than two courses of oral steroids in the past 12 months, who were also referred for hospital assessment/follow up for asthma<sup>o</sup>**

Prescribed more than two courses of oral steroid <u>AND</u> referred for hospital assessment/follow up	2018/19		
	All (N=3,054)	England (N=2,956)	Wales (N=74)
Yes	1,773 (58.1%)	1,713 (57.9%)	50 (67.6%)
No	386 (12.6%)	374 (12.7%)	12 (16.2%)
Not recorded	86 (2.8%)	83 (2.8%)	1 (1.4%)
Patient declined	35 (1.1%)	33 (1.1%)	2 (2.7%)
Already being seen in secondary care clinic	774 (25.3%)	753 (25.5%)	9 (12.2%)

<sup>o</sup> The denominator excludes patients who died as inpatients.



## Section 7: Sub-analyses

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This section contains sub-analyses of the 2018/19 data included in the previous sections, and presents associations between various metrics and:

- length of stay
- inpatient mortality
- review by a member of the respiratory specialist team.

### Navigation

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## 7.1 Asthma attack severity

Asthma attack severity was classified according to the NICE guideline<sup>p</sup> and BTS guideline<sup>q</sup> thresholds. Please note that the audit dataset is limited to collection of a smaller subset of physiological variables compared with the full list provided in the NICE/BTS guideline and therefore asthma attack severity categorisation provided here is indicative only. The physiological variables used to categorise asthma attack severity of patients included in the audit were heart rate, respiratory rate, oxygen saturation (where measured) and peak expiratory flow (where measured). In addition, patients with a heart rate of less than 30 beats per minute or a respiratory rate of less than 10 breaths per minute were classified as severe. Patients recorded as '*Patient too unwell*' for PEF measurement, whose other physiological measurements were normal, were classified as severe.

### 7.1.1 Categorisation of severity of acute asthma patient admissions

	2018/19		
	All (N=10,242)	England (N=9,700)	Wales (N=446)
Moderate acute asthma	3,547 (34.6%)	3,331 (34.3%)	181 (40.6%)
Severe acute asthma	5,266 (51.4%)	5,007 (51.6%)	211 (47.3%)
Life-threatening acute asthma	1,429 (14.0%)	1,362 (14.0%)	54 (12.1%)

### 7.1.2 Severity of asthma attack and associations with receipt of respiratory specialist review

Patient reviewed by a respiratory specialist	2018/19		
	Moderate acute asthma (N = 3,547)	Severe acute asthma (N = 5,266)	Life-threatening acute asthma (N=1,429)
Yes	2,456 (69.2%)	4,221 (80.2%)	1,193 (83.5%)
No	1,091 (30.8%)	1,045 (19.8%)	236 (16.5%)

### 7.1.3 Severity of asthma attack and associations with time to respiratory specialist review

	2018/19
	Median time until specialist review (hours) (Median with IQR)
Moderate acute asthma	19.5 (10.2 to 35.7)
Severe acute asthma	19.9 (10.8 to 36.2)
Life-threatening acute asthma	21.4 (11.9 to 38.0)

<sup>p</sup> NICE guidance on classification of asthma severity is available at: <https://bnf.nice.org.uk/treatment-summary/asthma-acute.html>

<sup>q</sup> BTS guidance on classification of asthma severity is available at: [www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/](http://www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/)

## 7.2 PEF measurement

### 7.2.1 PEF measurement recorded and associations with length of stay

	2018/19		
	PEF Not recorded (N=2,397)	Patient too unwell (N=391)	PEF recorded (N=7,431)
Length of stay ≤3 days	1,429 (59.6%)	150 (38.4%)	4,524 (60.9%)
Length of stay >3 days	968 (40.4%)	241 (61.6%)	2,907 (39.1%)

- There was no evidence of an effect of PEF measurement on length of stay (odds ratio (OR) = 0.95, 95% confidence interval (CI) 0.86 to 1.04).

### 7.2.2 PEF measurement recorded and associations with inpatient mortality

	2018/19		
	PEF Not recorded (N=2,411)	Patient too unwell (N=395)	PEF recorded (N=7,436)
Alive	2,397 (99.4%)	391 (99.0%)	7,431 (99.9%)
Died as inpatient	14 (0.6%)	4 (1.0%)	5 (0.1%)

- Patients who had their PEF taken on arrival were 90% less likely to die compared with those who did not have their PEF taken on arrival (OR = 0.12, 95% CI 0.04 to 0.30). This analysis excluded patients who were too ill to have their PEF taken on arrival. However, please note that there were a small number of deaths (N=23) included and the confidence intervals for the odds ratio are wide. The analysis has also not been adjusted for variables such as age or socioeconomic status.

### 7.2.3 PEF measurement taken within 4 hours of arrival at hospital and associations with length of stay

	2018/19	
	PEF taken within 4 hours (N=3,398)	PEF not taken within 4 hours (N=3,039)
Length of stay ≤3 days	2,268 (66.7%)	1,664 (54.8%)
Length of stay >3 days	1,130 (33.3%)	1,375 (45.2%)

- Patients with PEF taken within 4 hours were more likely to have a length of stay of 3 days or less compared with those who had a PEF taken more than 4 hours after arrival (OR = 1.66, 95% CI 1.50 to 1.84).



## 7.2.4 PEF measurement taken within 4 hours of arrival at hospital and associations with inpatient mortality

	2018/19	
	PEF taken within 4 hours (N=3,398)	PEF not taken within 4 hours (N=3,043)
Alive	3,398 (100.0%)	3,039 (99.9%)
Died as inpatient	0 (0.0%)	4 (0.1%)

- It was not possible to calculate odds ratios for the effect of PEF on mortality because there were no deaths in those who received PEF within 4 hours. Fisher's Exact test for a difference in proportions found moderate evidence that PEF taken within 4 hours was beneficial for survival ( $p=0.04977$ ). However, the low number of deaths ( $N=23$ ) overall make this result difficult to interpret. The analysis has also not been adjusted for variables such as age or socioeconomic status.

## 7.3 Systemic steroids

### 7.3.1 Time to systemic steroids and associations with length of stay

	2018/19	
	Time from arrival to systemic steroids $\leq 4$ hours (N=5,860)	Time from arrival to systemic steroids $> 4$ hours (N=3,107)
Length of stay $\leq 3$ days	3,524 (60.1%)	1,695 (54.6%)
Length of stay $> 3$ days	2,336 (39.9%)	1,412 (45.4%)

- Patients who received systemic steroids over 4 hours after arrival were 26% more likely to have a length of stay longer than 3 days when compared with those who received them within 4 hours (OR = 1.26 (95% CI 1.15 to 1.37)).

### 7.3.2 Time to systemic steroids and associations with inpatient mortality

	2018/19	
	Time from arrival to systemic steroids $\leq 4$ hours (N=5,870)	Time from arrival to systemic steroids $> 4$ hours (N=3,116)
Died as inpatient	10 (0.2%)	9 (0.3%)

- There is no evidence to support a difference in the likelihood of dying as an inpatient if patients were administered systemic steroids within 4 hours of arrival when compared with patients who received systemic steroids over 4 hours after arrival (OR = 1.70 (95% CI 0.69 to 4.18)). This may be due to this analysis being underpowered as the number of deaths was small ( $N=23$ ). The analysis has also not been adjusted for variables such as age or socioeconomic status.

## 7.4 $\beta_2$ agonists

### 7.4.1 Time to $\beta_2$ agonists and associations with length of stay

	2018/19	
	Time from arrival to $\beta_2$ agonists $\leq 4$ hours (N=7,292)	Time from arrival to $\beta_2$ agonists >4 hours (N=2,032)
Length of stay $\leq 3$ days	4,308 (59.1%)	1,135 (55.9%)
Length of stay >3 days	2,984 (40.9%)	897 (44.1%)

- Patients who received  $\beta_2$  agonists over 4 hours after arrival were 14% more likely to have a length of stay over 3 days compared with those who received  $\beta_2$  agonists within 4 hours of arrival (OR = 1.14 (95% CI 1.03 to 1.26)).

### 7.4.2 Time to $\beta_2$ agonists and associations with inpatient mortality

	2018/19	
	Time from arrival to $\beta_2$ agonists $\leq 4$ hours (N=7,306)	Time from arrival to $\beta_2$ agonists >4 hours (N=2,040)
Died as inpatient	14 (0.2%)	8 (0.4%)

- There is no evidence to support a difference in the likelihood of dying as an inpatient if patients were administered  $\beta_2$  agonists within 4 hours of arrival at hospital when compared with patients who were administered  $\beta_2$  agonists over 4 hours from arrival (OR = 2.05 (95% CI 0.86 to 4.89)). This may be due to this analysis being underpowered as the number of deaths was small (N=23). The analysis has also not been adjusted for variables such as age or socioeconomic status.

## 7.5 Respiratory specialist review

### 7.5.1 Respiratory specialist review and associations with length of stay

	2018/19	
	Respiratory specialist review (N=7,857)	No respiratory specialist review (N=2,362)
Length of stay $\leq 3$ days	4,102 (52.2%)	2,001 (84.7%)
Length of stay >3 days	3,755 (47.8%)	361 (15.3%)

- Patients who did not receive a respiratory specialist review were five times more likely to have a length of stay of less than 3 days (OR = 0.20 (95% CI 0.17 to 0.22)). A possible explanation for this finding may be that patients who were less acutely unwell were discharged quicker and therefore less likely to be seen by a specialist. Another reason may be that it takes time to organise review by a specialist and this in itself leads to a longer hospital stay.
- The median length of stay for those who received a respiratory specialist review was 3 days, while the median length of stay for those who did not receive a respiratory specialist review was 1 day.

**7.5.2 Respiratory specialist review and associations with inpatient mortality**

	2018/19	
	Respiratory specialist review (N=7,870)	No respiratory specialist review (N=2,372)
Died as inpatient	13 (0.2%)	10 (0.4%)

- Patients who received a specialist review were 2.5 times less likely to die as an inpatient, compared with patients who did not receive a specialist review (OR = 0.39 (95% CI 0.17 to 0.89)). However, please note that as there was a small number of deaths (N=23) the confidence intervals for the odds ratio are wide. The analysis has also not been adjusted for variables such as age or socioeconomic status.

**7.5.3 Respiratory specialist review and associations with addressing tobacco dependency in current smokers<sup>r</sup>**

	2018/19	
	Respiratory specialist review (N=1,629)	No respiratory specialist review (N= 492)
Tobacco dependency addressed, amongst those who are smokers	1,144 (70.2%)	112 (22.8%)

- Current smokers who received a respiratory specialist review were eight times more likely to have their tobacco dependency addressed (OR = 8.00 (95% CI 6.34 to 10.17)).

**7.5.4 Respiratory specialist review and associations with receiving a discharge bundle**

	2018/19	
	Respiratory specialist review (N=7,857)	No respiratory specialist review (N=2,362)
Received a discharge bundle	4,786 (60.9%)	140 (5.9%)

- Patients who received a respiratory specialist review were 25 times more likely to receive a care bundle (OR = 24.73 (95% CI 20.73 to 29.52)).

<sup>r</sup> Denominator includes current smokers only and does not include patients who died as inpatients

### 7.5.5 Respiratory specialist review and associations with receiving elements of good practice care on discharge

	Respiratory specialist review (N=7,857)	No respiratory specialist review (N=2,362)
Inhaler technique checked	5,645 (71.8%)	339 (14.4%)
Maintenance medication reviewed	6,309 (80.3%)	830 (35.1%)
Adherence discussed	5,133 (65.3%)	275 (11.6%)
Personalised asthma action plan issued/reviewed	4,042 (51.4%)	105 (4.4%)
Triggers discussed	4,773 (60.7%)	228 (9.7%)
Community follow-up requested within 2 working days	3,163 (40.3%)	298 (12.6%)
Specialist review requested within 4 weeks	4,686 (59.6%)	387 (16.4%)
None	615 (7.8%)	1,094 (46.3%)



## Section 8: Benchmarked key indicators

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### 8.1 Benchmarking of key indicators for participating hospitals

Table 1 shows the national medians, lower quartiles and upper quartiles for the key indicators that have been presented in the unadjusted benchmarking of hospitals ([Table 2](#)). The values presented in [Table 2](#) have been derived by the method shown visually in the box and whisker plot ([Fig 7](#)). More specifically, to create the 'box', data for each key indicator were ordered numerically from smallest (whisker; P0) to largest (whisker; P100) to find the median (P50), the middle point of the values. The data are divided into two halves, which are then divided in half again to identify the lower quartile (P25) and the upper quartile (P75).

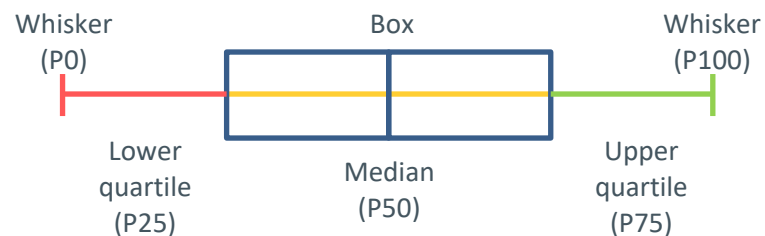
Please note that small case numbers should be treated with caution as they are less likely to provide an accurate picture of the average level of care delivered to patients across these key indicators.

**Table 1. The median and interquartile ranges for each key indicator**

Median and interquartile ranges (%)	Key indicators			
	Cases audited <sup>s</sup>	Peak expiratory flow taken following arrival at hospital (%)	Six elements of good practice care carried out before discharge (%) <sup>t</sup>	Current smoker had tobacco dependency addressed at discharge (%)
Lower quartile	29	67%	0%	43%
Median	52	79%	19%	62%
Upper quartile	83	86%	51%	80%

<sup>s</sup> The number of cases audited is not necessarily the denominator for any of the key indicators given.

<sup>t</sup> The six elements of good practice care before discharge included in this indicator are: inhaler technique checked, maintenance medication reviewed, adherence discussed, personalised asthma action plan issued/reviewed, tobacco dependency addressed (if a current smoker) and follow up (either community follow up requested within 2 working days and/or specialist review requested within 4 weeks).

**The colours refer to the quartile in which each result lies:****Red** = Result equal to or below lower quartile for that indicator**Amber** = Result above lower quartile but below upper quartile for that indicator**Green** = Result equal to or above upper quartile for that indicator**Grey** = Not applicable as no current smokers audited**Fig 7. Box and whisker plot****Table 2. Unadjusted benchmarking of key indicators for hospitals in England, Scotland and Wales**

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
<b>National medians</b>		<b>10,242</b>	<b>79%</b>	<b>19%</b>	<b>62%</b>
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Addenbrooke's Hospital	Cambridge University Hospitals NHS Foundation Trust	106	69%	98%	100%
Airedale General Hospital	Airedale NHS Foundation Trust	83	68%	23%	40%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)					
Barnet General Hospital	Royal Free London NHS Foundation Trust	55	63%	18%	50%
Barnsley District General Hospital	Barnsley Hospital NHS Foundation Trust	107	72%	36%	68%
Basildon Hospital	Basildon and Thurrock University Hospitals NHS Foundation Trust	113	77%	59%	63%
Basingstoke and North Hampshire Hospital	Hampshire Hospitals NHS Foundation Trust	5	40%	20%	100%
Bassetlaw District General Hospital	Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust	28	81%	4%	50%
Bedford Hospital	Bedford Hospital NHS Trust	54	60%	24%	64%
Birmingham City Hospital	Sandwell and West Birmingham Hospitals NHS Trust	94	79%	41%	65%
Birmingham Heartlands Hospital	University Hospitals Birmingham NHS Foundation Trust	65	81%	3%	14%
Bradford Royal Infirmary	Bradford Teaching Hospitals NHS Foundation Trust	230	65%	0%	45%
Bristol Royal Infirmary	University Hospitals Bristol NHS Foundation Trust	90	90%	54%	67%
Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust	48	98%	96%	100%
Charing Cross Hospital	Imperial College Healthcare NHS Trust	52	90%	56%	83%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Chelsea & Westminster Hospital	Chelsea And Westminster Hospital NHS Foundation Trust	56	67%	0%	7%
Cheltenham General Hospital	Gloucestershire Hospitals NHS Foundation Trust	8	43%	38%	NA
Chesterfield Royal	Chesterfield Royal Hospital NHS Foundation Trust	50	66%	80%	64%
Chorley Hospital	Lancashire Teaching Hospitals NHS Foundation Trust	54	63%	0%	79%
Colchester General Hospital	East Suffolk and North Essex NHS Foundation Trust	47	92%	49%	75%
Conquest Hospital	East Sussex Healthcare NHS Trust	32	55%	0%	43%
Countess of Chester Hospital	Countess of Chester Hospital NHS Foundation Trust	28	96%	4%	57%
County Hospital (Stafford)	University Hospitals of North Midlands NHS Trust	35	76%	11%	50%
County Hospital Hereford	Wye Valley NHS Trust	<5	100%	100%	NA
Croydon University Hospital	Croydon Health Services NHS Trust	100	66%	1%	10%
Cumberland Infirmary	North Cumbria University Hospitals NHS Trust	14	67%	29%	50%
Darent Valley Hospital	Dartford and Gravesham NHS Trust	33	76%	3%	0%
Darlington Memorial Hospital	County Durham and Darlington NHS Foundation Trust	47	82%	45%	80%



Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)					
Derriford Hospital	University Hospitals Plymouth NHS Trust	52	85%	46%	73%
Diana, Princess of Wales Hospital	Northern Lincolnshire and Goole NHS Foundation Trust	42	62%	24%	50%
Doncaster Royal Infirmary	Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust	45	95%	68%	100%
Dorset County Hospital	Dorset County Hospital NHS Foundation Trust	62	38%	0%	45%
Ealing Hospital	London North West University Healthcare NHS Trust	108	92%	10%	100%
East Surrey Hospital	Surrey and Sussex Healthcare NHS Trust	10	67%	10%	67%
Eastbourne District General Hospital	East Sussex Healthcare NHS Trust	6	0%	17%	100%
Epsom Hospital	Epsom and St Helier University Hospitals NHS Trust	34	74%	15%	67%
Fairfield General Hospital	Pennine Acute Hospitals NHS Trust	86	70%	17%	56%
Frimley Park Hospital	Frimley Health NHS Foundation Trust	100	78%	62%	72%
Furness General	University Hospitals of Morecambe Bay NHS Foundation Trust	27	80%	63%	100%
George Eliot Hospital	George Eliot Hospital NHS Trust	50	83%	84%	78%
Glenfield Hospital	University Hospitals of Leicester NHS Trust	100	88%	28%	48%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust	20	94%	0%	40%
Grantham and District General Hospital	United Lincolnshire Hospitals NHS Trust	18	83%	50%	100%
Harrogate District Hospital	Harrogate and District NHS Foundation Trust	47	85%	0%	0%
Hillingdon Hospital	The Hillingdon Hospitals NHS Foundation Trust	79	91%	39%	60%
Hinchingbrooke Hospital	North West Anglia NHS Foundation Trust	46	61%	0%	0%
Homerton Hospital	Homerton University Hospital NHS Foundation Trust	80	83%	40%	66%
Hull Royal Infirmary	Hull University Teaching Hospitals NHS Trust	144	69%	46%	35%
James Cook University Hospital	South Tees Hospitals NHS Foundation Trust	40	77%	62%	80%
James Paget Hospital	James Paget University Hospitals NHS Foundation Trust	57	88%	33%	57%
John Radcliffe Hospital	Oxford University Hospitals NHS Foundation Trust	55	93%	62%	82%
Kettering General Hospital	Kettering General Hospital NHS Foundation Trust	31	60%	6%	40%
King George Hospital	Barking, Havering and Redbridge University Hospitals NHS Trust	36	72%	0%	18%
King's College Hospital	King's College Hospital NHS Foundation Trust	36	53%	61%	89%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Kings Mill Hospital	Sherwood Forest Hospitals NHS Foundation Trust	66	42%	2%	42%
Kingston Hospital	Kingston Hospital NHS Foundation Trust	56	91%	14%	50%
Leicester Royal Infirmary	University Hospitals of Leicester NHS Trust	<5	50%	0%	NA
Leighton Hospital	Mid Cheshire Hospitals NHS Foundation Trust	42	62%	0%	62%
Lincoln County Hospital	United Lincolnshire Hospitals NHS Trust	77	90%	13%	89%
Lister Hospital	East and North Hertfordshire NHS Trust	106	79%	66%	85%
Luton and Dunstable Hospital	Luton and Dunstable University Hospital NHS Foundation Trust	102	86%	72%	77%
Lymington New Forest Hospital	Southern Health NHS Foundation Trust	13	100%	15%	100%
Macclesfield District General Hospital	East Cheshire NHS Trust	13	69%	0%	100%
Maidstone General Hospital	Maidstone and Tunbridge Wells NHS Trust	59	88%	80%	70%
Manchester Royal Infirmary	Manchester University NHS Foundation Trust	28	88%	75%	100%
Manor Hospital	Walsall Healthcare NHS Trust	50	48%	2%	57%
Medway Maritime Hospital	Medway NHS Foundation Trust	56	78%	45%	64%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Musgrove Park Hospital	Taunton and Somerset NHS Foundation Trust	68	95%	85%	85%
New Cross Hospital	The Royal Wolverhampton NHS Trust	115	80%	51%	83%
Norfolk and Norwich Hospital	Norfolk and Norwich University Hospitals NHS Foundation Trust	103	80%	56%	67%
North Devon District Hospital	Northern Devon Healthcare NHS Trust	7	86%	0%	0%
North Manchester General Hospital	Pennine Acute Hospitals NHS Trust	82	86%	28%	44%
North Middlesex Hospital	North Middlesex University Hospital NHS Trust	46	69%	0%	50%
Northampton General Hospital	Northampton General Hospital NHS Trust	121	85%	27%	78%
Northern General Hospital	Sheffield Teaching Hospitals NHS Foundation Trust	48	98%	75%	94%
Northumbria Specialist Emergency Care Hospital	Northumbria Healthcare NHS Foundation Trust	98	87%	89%	78%
Northwick Park Hospital	London North West University Healthcare NHS Trust	227	79%	42%	88%
Nottingham City Hospital	Nottingham University Hospitals NHS Trust	183	89%	56%	84%
Pilgrim Hospital	United Lincolnshire Hospitals NHS Trust	77	68%	9%	11%
Pinderfields General Hospital	Mid Yorkshire Hospitals NHS Trust	30	90%	7%	75%
Poole General Hospital	Poole Hospital NHS Foundation Trust	78	93%	90%	90%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Princess Alexandra Hospital	The Princess Alexandra Hospital NHS Trust	40	95%	48%	75%
Princess Royal Hospital (Haywards Heath)	Brighton and Sussex University Hospitals NHS Trust	13	54%	0%	100%
Queen Elizabeth Hospital, Edgbaston	University Hospitals Birmingham NHS Foundation Trust	86	91%	34%	90%
Queen Elizabeth Hospital, Gateshead	Gateshead Health NHS Foundation Trust	21	48%	0%	0%
Queen Elizabeth Hospital, Woolwich	Lewisham and Greenwich NHS Trust	39	85%	0%	18%
Queen Elizabeth the Queen Mother Hospital	East Kent Hospitals University NHS Foundation Trust	31	83%	52%	86%
Queen's Hospital	University Hospitals of Derby and Burton NHS Foundation Trust	65	73%	74%	100%
Queen's Hospital Romford	Barking, Havering and Redbridge University Hospitals NHS Trust	82	66%	0%	33%
Rotherham General Hospital	The Rotherham NHS Foundation Trust	62	83%	0%	36%
Royal Albert Edward Infirmary	Wrightington, Wigan and Leigh NHS Foundation Trust	<5	75%	0%	0%
Royal Berkshire Hospital	Royal Berkshire NHS Foundation Trust	145	84%	6%	43%
Royal Blackburn Hospital	East Lancashire Hospitals NHS Trust	275	92%	49%	73%
Royal Bolton Hospital	Bolton NHS Foundation Trust	9	88%	44%	0%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Royal Bournemouth General Hospital	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	89	75%	57%	80%
Royal Cornwall Hospital	Royal Cornwall Hospitals NHS Trust	115	80%	0%	48%
Royal Derby Hospital	University Hospitals of Derby and Burton NHS Foundation Trust	81	84%	56%	75%
Royal Devon and Exeter Hospital	Royal Devon and Exeter NHS Foundation Trust	56	82%	0%	43%
Royal Free Hospital	Royal Free London NHS Foundation Trust	56	88%	57%	56%
Royal Hampshire County Hospital	Hampshire Hospitals NHS Foundation Trust	69	20%	18%	80%
Royal Lancaster Infirmary	University Hospitals of Morecambe Bay NHS Foundation Trust	32	94%	69%	100%
Royal Liverpool University Hospital	Royal Liverpool and Broadgreen University Hospitals NHS Trust	82	65%	70%	71%
Royal Oldham Hospital	Pennine Acute Hospitals NHS Trust	61	66%	3%	22%
Royal Preston Hospital	Lancashire Teaching Hospitals NHS Foundation Trust	82	53%	0%	65%
Royal Stoke University Hospital	University Hospitals of North Midlands NHS Trust	202	65%	14%	21%
Royal Surrey County Hospital	Royal Surrey County Hospital NHS Foundation Trust	12	80%	0%	100%
Royal Sussex County Hospital	Brighton and Sussex University Hospitals NHS Trust	24	64%	0%	50%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Royal United Hospital Bath	Royal United Hospitals Bath NHS Foundation Trust	55	79%	51%	50%
Royal Victoria Infirmary	The Newcastle Upon Tyne Hospitals NHS Foundation Trust	23	43%	4%	40%
Russells Hall Hospital	The Dudley Group NHS Foundation Trust	54	76%	30%	93%
Salford Royal Hospital	Salford Royal NHS Foundation Trust	99	79%	0%	31%
Salisbury District Hospital	Salisbury NHS Foundation Trust	67	73%	64%	89%
Sandwell District Hospital	Sandwell and West Birmingham Hospitals NHS Trust	103	73%	11%	59%
Scarborough General Hospital	York Teaching Hospital NHS Foundation Trust	98	15%	27%	65%
Scunthorpe General Hospital	Northern Lincolnshire and Goole NHS Foundation Trust	74	84%	26%	67%
South Tyneside District Hospital	South Tyneside NHS Foundation Trust	62	82%	23%	70%
Southampton General Hospital	University Hospital Southampton NHS Foundation Trust	31	63%	3%	44%
Southend Hospital	Southend University Hospital NHS Foundation Trust	100	65%	36%	53%
Southmead Hospital	North Bristol NHS Trust	99	89%	47%	78%
Southport and Formby District General	Southport and Ormskirk Hospital NHS Trust	86	74%	2%	0%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
St George's Hospital	St George's University Hospitals NHS Foundation Trust	22	50%	0%	67%
St Helier Hospital	Epsom and St Helier University Hospitals NHS Trust	38	85%	66%	20%
St James's University Hospital	Leeds Teaching Hospitals NHS Trust	36	83%	0%	0%
St Marys Hospital, Paddington	Imperial College Healthcare NHS Trust	121	95%	69%	58%
St Peter's Hospital	Ashford and St Peter's Hospitals NHS Foundation Trust	49	83%	0%	67%
St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust	30	73%	30%	62%
St Thomas' Hospital	Guy's and St Thomas' NHS Foundation Trust	<5	100%	100%	100%
Stepping Hill Hospital	Stockport NHS Foundation Trust	99	73%	1%	42%
Sunderland Royal Hospital	City Hospitals Sunderland NHS Foundation Trust	43	85%	0%	17%
Tameside General Hospital	Tameside And Glossop Integrated Care NHS Foundation Trust	101	46%	6%	17%
The Ipswich Hospital	East Suffolk and North Essex NHS Foundation Trust	12	75%	33%	100%
Torbay Hospital	Torbay and South Devon NHS Foundation Trust	98	58%	0%	53%
Tunbridge Wells Hospital	Maidstone and Tunbridge Wells NHS Trust	47	86%	89%	88%



Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
University Hospital Coventry	University Hospitals Coventry and Warwickshire NHS Trust	143	61%	65%	85%
University Hospital Lewisham	Lewisham and Greenwich NHS Trust	19	74%	11%	100%
University Hospital of North Durham	County Durham and Darlington NHS Foundation Trust	74	70%	0%	62%
University Hospital of North Tees	North Tees and Hartlepool NHS Foundation Trust	172	78%	0%	45%
Victoria Hospital	Blackpool Teaching Hospitals NHS Foundation Trust	71	78%	24%	55%
Warrington District General Hospital	Warrington and Halton Hospitals NHS Foundation Trust	13	75%	77%	67%
Warwick Hospital	South Warwickshire NHS Foundation Trust	73	41%	3%	20%
Watford General Hospital	West Hertfordshire Hospitals NHS Trust	86	54%	23%	44%
West Middlesex University Hospital	Chelsea And Westminster Hospital NHS Foundation Trust	30	86%	27%	60%
West Suffolk Hospital	West Suffolk NHS Foundation Trust	10	90%	0%	33%
Wexham Park Hospital	Frimley Health NHS Foundation Trust	113	68%	35%	57%
Whiston Hospital	St Helens And Knowsley Teaching Hospitals NHS Trust	58	84%	5%	44%
Whittington Hospital	Whittington Health NHS Trust	67	70%	13%	0%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>England (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
William Harvey Hospital	East Kent Hospitals University NHS Foundation Trust	28	79%	32%	43%
Worcestershire Royal Hospital	Worcestershire Acute Hospitals NHS Trust	31	43%	0%	0%
Worthing Hospital	Western Sussex Hospitals NHS Foundation Trust	34	76%	6%	43%
Wythenshawe Hospital	Manchester University NHS Foundation Trust	102	74%	22%	70%
York District Hospital	York Teaching Hospital NHS Foundation Trust	94	84%	57%	71%
<b>Scotland (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Balfour Hospital	Orkney	5	40%	0%	0%
Dumfries and Galloway Royal Infirmary	Dumfries and Galloway	26	58%	0%	0%
Forth Valley Royal Hospital	Forth Valley	7	100%	43%	100%
Inverclyde Royal Hospital	Greater Glasgow & Clyde	35	83%	57%	100%
Ninewells Hospital	Tayside	8	50%	0%	50%
Wishaw General Hospital	Lanarkshire	15	80%	60%	NA

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>Wales (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Bronglais General Hospital	Hywel Dda University LHB	9	75%	0%	0%
Glan Clwyd Hospital	Betsi Cadwaladr University Health Board	26	73%	0%	88%
Glangwili General Hospital	Hywel Dda University LHB	13	67%	8%	50%
Llandough Hospital	Cardiff and Vale University LHB	74	89%	12%	46%
Morriston Hospital	Abertawe Bro Morgannwg University LHB	78	76%	0%	16%
Nevill Hall Hospital	Aneurin Bevan University LHB	14	100%	86%	100%
Prince Charles Hospital	Cwm Taf University LHB	34	87%	0%	50%
Princess of Wales Hospital	Abertawe Bro Morgannwg University LHB	41	95%	0%	42%
Prince Philip Hospital	Hywel Dda University LHB	26	92%	38%	67%
Royal Glamorgan	Cwm Taf University LHB	28	86%	0%	56%
Singleton Hospital	Abertawe Bro Morgannwg University LHB	37	86%	0%	0%
University Hospital of Wales	Cardiff and Vale University LHB	38	87%	8%	71%

Hospital name	Trust / health board name	Cases audited	Peak expiratory flow taken following arrival at hospital	Six elements of good practice care carried out before discharge	Current smoker had tobacco dependency addressed at discharge
		N	%	%	%
National medians		10,242	79%	19%	62%
<b>Wales (Please note the number of cases audited is not necessarily the denominator for any of the key indicators given)</b>					
Withybush General Hospital	Hywel Dda University LHB	12	82%	17%	100%
Ysbyty Ystrad Fawr	Aneurin Bevan University LHB	16	81%	0%	100%

## 8.2 Non-participating hospitals in England, Scotland and Wales

The hospitals included in this list either did not register for the audit (denoted in grey), or were registered, but did not enter any data for the period reported on in this analysis. Registration or data entry after the deadline of 10 May 2019 is not reflected here.

Hospital name	Trust/health board name
<b>England</b>	
Arrowe Park Hospital	Wirral University Teaching Hospital NHS Foundation Trust
Broomfield Chelmsford	Mid Essex Hospital Services NHS Trust
Friarage Hospital	South Tees Hospitals NHS Foundation Trust
Good Hope General Hospital	University Hospitals Birmingham NHS Foundation Trust
Horton General Hospital	Oxford University Hospitals NHS Foundation Trust
Leeds General Infirmary	Leeds Teaching Hospitals NHS Trust
Newham General Hospital	Barts Health NHS Trust
Peterborough City Hospital	North West Anglia NHS Foundation Trust
Princess Royal Hospital, Telford	Shrewsbury and Telford Hospital NHS Trust
Princess Royal University Hospital (Bromley)	King's College Hospital NHS Foundation Trust
Queen Alexandra Hospital	Portsmouth Hospitals NHS Trust
Queen Elizabeth Hospital, King's Lynn	The Queen Elizabeth Hospital, King's Lynn, NHS Foundation Trust
Royal Shrewsbury Hospital	Shrewsbury and Telford Hospital NHS Trust
Solihull General Hospital	University Hospitals Birmingham NHS Foundation Trust
The Great Western Hospital	Great Western Hospitals NHS Foundation Trust
Trafford General Hospital	Manchester University NHS Foundation Trust
University Hospital Aintree	Aintree University Hospital NHS Foundation Trust
West Cumberland Hospital	North Cumbria University Hospitals NHS Trust
Weston General Hospital	Weston Area Health NHS Trust
Whipps Cross Hospital	Barts Health NHS Trust
Yeovil District Hospital	Yeovil District Hospital NHS Foundation Trust
<b>Scotland</b>	
Aberdeen Royal Infirmary	NHS Grampian
Belford Hospital	NHS Highland
Borders General Hospital	NHS Borders
Gartnavel General	NHS Greater Glasgow and Clyde

Hospital name	Trust/health board name
Gilbert Bain Hospital	NHS Shetland
Glasgow Royal Infirmary	NHS Greater Glasgow and Clyde
New Victoria Hospital	NHS Greater Glasgow and Clyde
Perth Royal Infirmary	NHS Tayside
Royal Alexandra Hospital	NHS Greater Glasgow and Clyde
Royal Infirmary of Edinburgh	NHS Lothian
St John's Hospital at Howden	NHS Lothian
Stobhill General Hospital	NHS Greater Glasgow and Clyde
University Hospital Ayr	NHS Ayrshire and Arran
University Hospital Crosshouse	NHS Ayrshire and Arran
University Hospital Hairmyres	NHS Lanarkshire
University Hospital Monklands	NHS Lanarkshire
Victoria Hospital (Kirkcaldy)	NHS Fife
Western General Hospital	NHS Lothian
Western Isles Hospital	NHS Western Isles
<b>Wales</b>	
Maelor Hospital	Betsi Cadwaladr University Health Board
Royal Gwent Hospital	Aneurin Bevan University LHB
Ysbyty Gwynedd Hospital	Betsi Cadwaladr University Health Board

## Appendix A: Methodology

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#### Methodology of the audit creation and set up

A continuous national asthma audit was recommended in the 2014 National Review of Asthma Deaths report following the learnings from the confidential enquiry.<sup>3</sup> Subsequently, the Asthma Audit Development Project (AADP) was commissioned between February 2017 and February 2018 to carry out the ground work required to set up a national audit of asthma care in adult and paediatric secondary care services, as well as primary care. This specifically involved the development of national audit datasets, including the precursor to the current adult asthma audit dataset.

The NACAP, which was commissioned from March 2018, following completion of the AADP, launched the adult asthma audit component in November 2018. This is the first report since the start of continuous data collection and presents the results of the cohort of patients that arrived at hospital on or after 1 November 2018, who were admitted to adult services, *and* were discharged by 31 March 2019. The short report, presenting key findings and recommendations, can be found at: [www.rcplondon.ac.uk/adult-asthma-2018-19](http://www.rcplondon.ac.uk/adult-asthma-2018-19) alongside a quality improvement slide set and patient report.

All hospitals in England, Scotland and Wales (N=219) that admit adult patients with asthma attacks were eligible to participate in the audit. A total of 188 hospitals registered for the audit (86%) and 170 (78%) hospitals entered data for this period of the audit. A full list of non-participating hospitals, including those that registered but did not enter any data for the audit period, is provided in [section 8](#).

#### ***Information governance and data storage, security and transfer***

This audit operates under Section 251 approval in England and Wales from the Confidentiality Advisory Group (CAG) of the Health Research Authority (reference number: CAG 8-06(b)/2013), as well as Public Benefit and Privacy Panel for Health approval (reference number: 1718-0134) in Scotland. These approvals allow hospitals to collect patient identifiable data for the audit without consent due to the acuity of the cohort on arrival at hospital and the high number of admissions treated for asthma attacks annually. A record of these approvals can be found at:

- [www.hra.nhs.uk/about-the-hra/our-committees/section-251/cag-advice-and-approval-decisions](http://www.hra.nhs.uk/about-the-hra/our-committees/section-251/cag-advice-and-approval-decisions) (April 2013 onwards; non research)
- [www.informationgovernance.scot.nhs.uk/pbpphsc/application-outcomes/](http://www.informationgovernance.scot.nhs.uk/pbpphsc/application-outcomes/) (Public Benefit and Privacy Panel Application Outcomes 2018-2019)

To find out more about the audit's information governance (IG), legal basis, data storage, security and transfer agreements, please review the adult asthma fair processing document, IG frequently asked questions (FAQs) and the audit's data flow diagram, all of which can be found on the audit resources page: [www.rcplondon.ac.uk/nacap-adult-asthma](http://www.rcplondon.ac.uk/nacap-adult-asthma). In addition, a patient information leaflet and poster are available to download from the same page.

#### ***Recruitment***

The recruitment process for this audit started in June 2018 using the following channels:

- communication with hospitals in England and Wales participating in the COPD clinical audit
- direct communications to health board chief executives/medical directors as well as local respiratory network leads in Scotland
- partner and stakeholder channels
- NACAP launch information packs sent directly to trust/health board chief executives in England, Scotland and Wales
- NACAP twitter and newsletters.

A two-step registration process was followed:

1. All hospitals were required to complete a registration form, providing the contact details and job title of a 'clinical lead' as well as a 'clinical audit lead'. Web tool accounts were set up for these contacts by the RCP audit team.
2. Hospitals in England and Wales were also required to forward a letter directly to their Caldicott Guardian. The letter provided an overview of the audit and the legal approvals in place to collect patient identifiable data without consent. Caldicott Guardians were required to populate, sign and return a form to confirm approval in order for eligible hospitals in their trust/health board to take part. Only after both the registration form *and* Caldicott Guardian form were completed did the audit team at the RCP consider the hospital as fully registered and approve hospital access to the audit web tool.
  - a. In Scotland, Caldicott Guardian approval was not required for individual hospitals/health boards as the Public Benefit and Privacy Panel for Health approval is deemed to be the ultimate information governance authorisation (precluding the need for any others). Therefore, teams were asked to forward a letter to their Caldicott Guardian for information purposes only.

The contacts provided within the hospital registration form were registered in the web tool as having one of two roles: 'lead clinician' or 'data inputter'. The former were able to approve the creation of new users for that hospital following the launch of the audit, as well as ensure that new users were suitable from an information governance perspective. The latter were able to create account requests for new users which required approval by the lead clinician.

The audit team chased the registration and Caldicott Guardian forms up to, and post launch of the audit.

### ***Audit question development and pilot***

The audit dataset was developed during the AADP<sup>u</sup> and further streamlined by the audit programme team and clinical lead, in consultation with the NACAP asthma advisory group. A pilot audit was carried out between 1 August 2018 and 31 August 2018 as part of the dataset testing and finalisation process under the NACAP. Seventeen hospitals took part in the pilot and were asked to assess the comprehensibility of the questions and answers, ensure the help-text and rationale was comprehensive, identify opportunities for streamlining the dataset and assess the strength and accuracy of validations applied within the web tool.

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<sup>u</sup> For more information about the AADP and the development of the initial adult asthma audit dataset visit: [www.rcplondon.ac.uk/projects/asthma-audit-development-project](http://www.rcplondon.ac.uk/projects/asthma-audit-development-project)



**Fig 8. Distribution of hospital sites involved in the NACAP adult asthma audit dataset pilot between 1 August and 31 August 2018**



Feedback from the pilot was discussed and reviewed by the NACAP team (including the analysis team at Imperial College London) before the dataset was amended and finalised ahead of the audit launch.<sup>v</sup> Please note that all dataset items are mapped to relevant guidelines and standards. The dataset also includes a NACAP patient priority (developed following an extensive public survey, focus groups and discussion by the NACAP patient panel).

### **Data entry**

Hospitals are required to enter data via the audit programme's bespoke web tool, created by Crown Informatics Ltd (available at [www.nacap.org.uk](http://www.nacap.org.uk)).

Guidance documentation to support participation in the audit, such as the dataset with help notes, data collection sheets, audit technical guidance and FAQs are available to download from both the web tool ([www.nacap.org.uk](http://www.nacap.org.uk)) and the adult asthma audit resources webpage on the RCP website ([www.rcplondon.ac.uk/nacap-adult-asthma](http://www.rcplondon.ac.uk/nacap-adult-asthma)). Data entry to the audit is regularly reviewed by the NACAP team. Reminders about audit data entry timelines, tailored to hospitals participating at different rates (ie hospitals with 0 records, less than 20 records, less than 50 records), are sent to registered teams to support continuous data collection. Data entry deadlines are also provided on the homepage of the audit web tool once users are logged in, as well as through NACAP newsletters. The NACAP team also communicate directly with non-participating hospitals to understand the reasons behind lack of participation, providing advice where possible.

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<sup>v</sup> Anonymised hospital feedback following the audit pilot is publicly available at: [www.rcplondon.ac.uk/projects/outputs/national-asthma-and-copd-audit-programme-nacap-secondary-care-workstream-adult](http://www.rcplondon.ac.uk/projects/outputs/national-asthma-and-copd-audit-programme-nacap-secondary-care-workstream-adult)

### ***Telephone and email support***

The audit programme team at the RCP provide a helpdesk 9am–5pm every working day, which is available via both telephone and email, so that participants can contact the team directly with any questions.

## **Analysis methodology**

### ***Deadline and data transfer***

The data entry deadline for completion of records (patients who arrived at hospital on or after 1 November 2018, were admitted to adult services, *and* were discharged by 31 March 2019) was 10 May 2019 at 12pm. Thereafter, the data were extracted by Crown Informatics Ltd, drafts were excluded and the data were anonymised as follows:

- NHS/CHI number replaced by an anonymised patient identifier
- postcode replaced by a Lower Layer Super Output Area (LSOA)
- date of birth replaced by calculated age
- date of death replaced with a life status flag.

The anonymised file, containing non-identifiable patient data, was then sent via secure file transfer to the analysis team at Imperial College London (National Heart and Lung Institute) where they were analysed.

### ***Data cleaning and analysis***

The data were analysed at Imperial College London (National Heart and Lung Institute) using R version 3.5.0. Times and dates were converted from string date/time format using the 'Chron' R package. Dates were converted to days of the week using the 'weekdays' command in R.

Data checking and cleaning occurred sequentially as follows:

- Records marked as containing invalid NHS/CHI numbers were removed (N=52). Likely reasons for invalid NHS/CHI numbers may be as follows:
  - the patient(s) is from overseas
  - the patient(s) has no fixed abode
  - they are a private patient for which an NHS/CHI number cannot be found, or is incorrect.
- All patients included in the analysis pertained to the correct audit period (arriving from 1 November 2018 and discharged by 31 March 2019).
- No patients had invalid values for heart rates, respiratory rates, oxygen saturation or PEF.
- Patients with first recorded PEF values following arrival at hospital, who were also marked as not having a PEF, were removed (N=4).
- Patients with a date for their first recorded PEF value, who were also marked as not having a date for their PEF value, were removed (N=2).
- Patients with dates for when their first recorded PEF value was recorded, who did not have PEF values, were removed (N=4).
- Patients with the time of their first recorded PEF value over 1 hour before arrival, were removed (N=15).
- Patients with a first recorded PEF measurement, who were also marked as not having a PEF measurement, were removed (N=1).

- Patients with a date recorded for their respiratory review, who were also marked as not having a respiratory review, were removed (N=5).
- No patients had a time for their respiratory review that was before their arrival date and time.
- Patients with a date for administration of systemic steroids, who were also marked as not administered steroids, were removed (N=36).
- Patients with a date for administration of systemic steroids, who were also marked as steroids not recorded, were removed (N=16).
- No patients had a time for administration of steroids that was before their arrival date and time.
- Patients with a date for administration of  $\beta_2$  agonists, who were also marked as  $\beta_2$  agonists not recorded, were removed (N=4).
- No patients had a time for administration of  $\beta_2$  agonists that was before their arrival date and time.
- Patients who were not marked as having any of the specified elements of good practice care (including 'none'), who were alive at discharge, were removed (N=1).
- No patients who died as an inpatient had a discharge date.
- No patients had a discharge date and time that was before their arrival, PEF measurement, administration of systemic steroids or  $\beta_2$  agonists date and time.
- Duplicate records were removed (N=46).

***Data analysis of the clean data (N=10,242) occurred as follows:***

- Median and interquartile ranges were calculated using the 'quantile' command in R.
- Proportions were calculated using the 'table' and 'prop. table' command in R.
- The 'cut' function in R was used on continuous or discrete variables which required categorisation for analysis:
  - day and time of arrival at hospital – split into 2-hour time categories
  - PEF as a % best/predicted PEF – split into <75% and  $\geq 75\%$
  - time from arrival until administration of systemic steroids - split into  $\leq 1$  hour and >1 hour /  $\leq 4$  hours and >4 hours
  - time from arrival until administration of  $\beta_2$  agonists – split into  $\leq 1$  hour and >1 hour /  $\leq 4$  hours and >4 hours
  - time from arrival until discharge – split into  $\leq 3$  days and >3 days
  - the appropriate IMD quintile for England, Scotland and Wales was assigned to each patient using the patients' LSOA11 code. 197 patients did not have an LSOA11 code and so could not be linked to an IMD quintile.
  - asthma severity was classified according to the NICE guideline<sup>w</sup> and BTS guideline<sup>x</sup> thresholds for heart rate, respiratory rate, oxygen saturation (where measured) and PEF (where measured). In addition, patients with a heart rate <30 beats per minute or a respiratory rate <10 breaths per minute were classified as severe. Patients recorded as 'Patient too unwell' for PEF measurement, whose other physiological measurements were normal, were classified as severe.

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<sup>w</sup> NICE guidance on classification of asthma severity is available at: <https://bnf.nice.org.uk/treatment-summary/asthma-acute.html>

<sup>x</sup> BTS guidance on classification of asthma severity is available at: [www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/](http://www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/)

- odds ratios with confidence intervals were calculated using the 'glm' command with a single explanatory variable connected to the outcome through a binomial logit link.
- Kaplan-Meier curves were created using the 'survfit' package in R.

### ***Case ascertainment***

The overall case ascertainment figure for the audit data collection period, 39% (10,242/26,164 eligible admissions), provided on page 8 of the national report (available at:

[www.rcplondon.ac.uk/adult-asthma-2018-19](http://www.rcplondon.ac.uk/adult-asthma-2018-19)) was derived on receipt of overall admission data from external data sources as follows:

- Data request applications for nation-level admission numbers were submitted to NHS Digital (NHSD) for Hospital Episode Statistics (HES) data, NHS Wales Informatics Service (NWIS) for Patient Episode Database for Wales (PEDW) data and the electronic Data Research and Innovation Service (eDRIS), part of NHS National Services Scotland.
- The specification for nation-level admissions numbers was as follows:
  - an overall figure for all adult patients coded with the following ICD-10 codes in the primary position of the first episode of care:
    - J45.0 - Predominantly allergic asthma
    - J45.1 - Non-allergic asthma
    - J45.8 - Mixed asthma
    - J45.9 - Asthma, unspecified
    - J46.0 - Status asthmaticus (*Includes.: Acute severe asthma*)
  - including only patients aged 16 years and over on the date of arrival
  - including only patients that arrived on or after 1 November 2018 that were admitted to hospital and discharged by 31 March 2019

## Appendix B: References

### [Back to contents](#)


- 1 British Thoracic Society (BTS) / Scottish Intercollegiate Guidelines Network (SIGN). *SIGN 153: British guideline on the management of asthma – A national clinical guideline*. [Updated July 2019]. <https://www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/> [Accessed July 2019]
- 2 National Institute for Health and Care Excellence. *Smoking: supporting people to stop. NICE Quality standard 43 (QS43)*. London: NICE, 2013. [www.nice.org.uk/guidance/qs43](http://www.nice.org.uk/guidance/qs43) [Accessed July 2019]
- 3 Royal College of Physicians. *Why asthma still kills: the National Review of Asthma Deaths (NRAD) Confidential Enquiry report*. London: RCP, 2014. [www.rcplondon.ac.uk/projects/outputs/why-asthma-still-kills](http://www.rcplondon.ac.uk/projects/outputs/why-asthma-still-kills) [Accessed July 2019]
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