



An Audit of Adult Asthma Care Within Northern Ireland Inpatient and Emergency Department Settings

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Assurance, Challenge and Improvement in Health and Social Care

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Clinical audit report

1. Background/rationale

The Department of Health (DoH) has developed a range of service frameworks in an effort to improve the health and social wellbeing of the people in Northern Ireland. The service frameworks set out explicit standards for health and social care that are evidence based and can be measured. These are informed by expert advice and national standard setting bodies such as the National Institute for Health and Care Excellence (NICE) and the Social Care Institute for Excellence (SCIE). The measuring of some standards requires audits to support the implementation process of the Service Frameworks.

The Respiratory Service Framework (RSF) is the Northern Ireland service framework for respiratory health and wellbeing which was first launched in November 2009 and completed its first three-year implementation cycle in 2012. The implementation process was subsequently reviewed by the Regulation and Quality Improvement Authority (RQIA) with overall positive feedback in achieving its objectives. The RSF standards were then subsequently reviewed and consulted on in January 2014.

The aim of the RSF is to improve the health and wellbeing of the population of Northern Ireland, reduce inequalities and improve the quality of health and social care in relation to respiratory disease. The RSF sets standards in relation to the prevention, assessment, diagnosis, treatment, care, rehabilitation and palliative care of individuals/communities who currently have or are at risk of developing respiratory disease. The standards aim to ensure that health and social care services are safe, effective, efficient, accessible, patient/client centred and equitable.

Asthma in Adults

Since 2004 as part of the Quality and Outcomes Framework (QOF), General Practitioners (GPs) have been compiling disease registers. One of these is a register of patients with asthma, excluding patients with asthma who have been prescribed no asthma-related drugs in the previous 12 months. The Northern Ireland Statistics & Research Agency (NISRA) published data which shows that 122,178 people were recorded on the asthma register in 2018 in Northern Ireland.

The Scottish Intercollegiate Guidelines Network (SIGN) and British Thoracic Society (BTS) published guidance in 2016 entitled 'British guideline on the management of asthma: A national clinical guideline' which makes recommendations for the assessment and management of asthma. The general aim of treatment is to reduce the frequency and severity of asthma symptoms, therefore it is important that people with asthma and their families know how to manage the asthma. There are three aspects of treatment: (i) primary prevention (ii) management of acute attacks and (iii) treatment of

chronic asthma. These guidelines have been informed by the 2014 report 'Why asthma still kills' produced by the Royal College of Physicians, which was the first National Review of Asthma Deaths (NRAD) in the UK.¹ This national investigation aimed to understand the circumstances surrounding asthma deaths to help to identify avoidable factors and make recommendations to improve care and reduce the number of deaths. This audit focusses on the management of acute attacks and other exacerbations of asthma, which clinicians and patient groups consider an area of particular importance.

Management of exacerbations of asthma at emergency departments (ED) and during hospital admissions

Acute severe asthma can be a life threatening condition requiring rapid access to emergency services for prompt and accurate assessment. Emergency departments and secondary care services need to be able to accurately assess the severity of the exacerbation and provide appropriate urgent treatment. It is important that those who attended these services have a follow up review of their asthma control.

Standard 27 of the Respiratory Service Framework (RSF) outlines that "all patients with acute severe asthma should be accurately assessed and managed appropriately according to the severity of their presentation".

It had originally been envisaged that the British Thoracic Society (BTS) would be including adult asthma in its national audit programme, but this has been suspended indefinitely. Consequently, the Respiratory Forum opted to seek and obtain RQIA funding to undertake this audit and assess service performance against RSF standards, key performance indicators and the national guidance

For logistical reasons, it was not feasible to extend this audit into primary care, where most patients with moderately severe asthma exacerbations are cared for. There is an ongoing rolling asthma audit in primary care funded by pharmaceutical companies that uses comparable standards and might in future provide comprehensive audit data of high quality to fill this gap.

¹ Royal College of Physicians. Why asthma still kills: the national review of asthma deaths (NRAD). Confidential enquiry report 2014. [cited 26 Jul 2016]. Available from url: <https://www.rcplondon.ac.uk/projects/outputs/why-asthma-still-kills>

2. Aim

To assess inpatient and ED services for adults with an exacerbation of asthma (acute severe) in line with the management of asthma outlined in the SIGN/BTS guidelines and standards set out in the RSF in order to make appropriate recommendations for service development and improvement.

3. Objectives

- To determine if patients presenting with an acute exacerbation of asthma to ED have a documented clinical assessment, peak flow measurement and oxygen saturation measurement according to current acute asthma guidelines
- To determine if patients presenting with an acute exacerbation of asthma to ED are managed according to SIGN / BTS guidance
- To establish that systems are in place to identify people presenting with acute severe asthma in ED
- To explore whether patients with an acute exacerbation of asthma are recommended follow up by a GP in primary care or by a hospital clinician within the timeframe suggested by SIGN/BTS guidance after an acute episode or after attendance at ED
- To establish if people with acute severe asthma are managed in a respiratory ward or formally designated respiratory area within a ward
- To determine if people with acute severe asthma admitted to hospital with an exacerbation received care from a respiratory team
- To establish if people admitted with acute severe asthma on beta-2-agonist therapy only are commenced on inhaled corticosteroids
- To determine if people admitted with acute severe asthma receive a written personal asthma action plan (PAAP)
- To determine if people with acute severe asthma, who are admitted, have appropriate inpatient and discharge planning as per BTS guidelines
- To inform future service development, organisation, education and training

4. Standards/guidelines/evidence base

4.1 Key Performance Indicators (KPIs)

The below table lists the KPIs that are relevant to this audit from the RSF. Where the KPI differs from SIGN/BTS guidance, we have used SIGN/BTS guidelines as the standard from which to compare the data.

Criteria		Target (%)	Evidence
KPI 23a	ADULTS Percentage (%) of people with acute severe asthma presenting to ED or OoH* who have a post bronchodilator PFR carried out. *only those people requiring to be nebulised in OoH.	50% (OoH) 80% (ED)	RSF/BTS/SIGN/NICE https://www.health-ni.gov.uk/publications/respiratory-health-and-well-being-service-framework-documents https://www.sign.ac.uk/sign-153-british-guideline-on-the-management-of-asthma.html https://www.nice.org.uk/guidance/ng80
KPI 23d	ADULTS Percentage (%) of people with acute severe asthma presenting in GP practices, OoH, emergency departments or ambulatory care settings with a record of follow-up (telephone or face-to-face) within 14 days of the episode by the GP, practice nurse, community or secondary care.	Establish baseline	
KPI 23f	ADULTS Percentage (%) of people with acute severe asthma who are managed in a respiratory ward or formally designated respiratory area within a ward.	90%	
KPI 23g	ADULTS Percentage (%) of people with acute severe asthma admitted to hospital with an exacerbation who received care from a respiratory team.	80%	
KPI 23h	ADULTS Percentage (%) of people admitted with acute severe asthma on beta-2-agonist therapy only who are commenced on inhaled corticosteroids.	90%	
KPI 23i	ADULTS Percentage (%) of people admitted with acute severe asthma who receive a written discharge care plan.	80%	

4.2 Key recommendations from SIGN 153 British guideline on the management of asthma, September 2016

It is important to note that the SIGN/BTS recommendations are in the process of being updated and an updated guideline is due to be published in 2019. Furthermore, Nice Quality Standard 25 (QS25) published in 2013, which SIGN/BTS guidance refers to above, was reviewed in September 2018. Some quality standards have since been

updated including 1, 3, 6, 10 and 11. Statements from the 2013 version (numbered 2, 4, 5, 7, 8 and 9) are no longer considered national priorities for improvement, but may still be useful at a local level. These may be viewed at the following link.

<https://www.nice.org.uk/guidance/qs25/chapter/update-information#update-information>

The updated NICE quality statements are as follows:

Statement 1 People aged 5 years and over with suspected asthma have objective tests to support diagnosis. [2013, updated 2018]

Statement 2 People aged 5 years and over with asthma discuss and agree a written personalised action plan. [2013, updated 2018]

Statement 3 People with asthma have their asthma control monitored at every asthma review. [2013, updated 2018]

Statement 4 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. [2013, updated 2018]

Statement 5 People with suspected severe asthma are referred to a specialist multidisciplinary severe asthma service. [2013, updated 2018]

5. Methodology

5.1 Background

A project team was established by the public health respiratory lead within the Public Health Agency (PHA), and Health and Social Care Trust (HSCT). Nominations were sought through the Respiratory Forum. The team included respiratory nurses, medical staff, the regional respiratory lead and project manager within the PHA and RQIA audit staff. The project team agreed the methodology, data sources, patient sample sizes, audit standards, data collection tools, data analysis and final report.

5.2 Sample

A request for total admission numbers from the Patient Administration System (PAS) for the months of May 2017, September 2017 and January 2018 was made to the Health and Social Care Board (HSCB) information department. ICD-10 codes were used to identify relevant patients, of which there were 285. The required sample size for each HSCT was determined using the ©Raosoft sample calculator (an electronic database to provide random sampling numbers and confidence levels).

The total sample size for the inpatient audit was 171 cases from all five HSCTs. Patients were sequentially selected in order of the date of attendance/admission, and their clinical notes were audited if available, until the predetermined sample sizes for each HSCT were reached. The sample size for the ED audit was 360, however two hospitals did not participate and so the final sample number was 271. The distribution of patients across all HSCTs is outlined below.

Audit sample size by Trust - inpatient audit

HSCT	Total admissions during audit months (May '17, Sept '17, Jan '18)	Sample size
BHSCT	71	45
NHSCT	50	30
SET	81	43
SHSCT	45	26
WHSCT	38	27
	285	171

Audit sample size by Trust - ED audit

Trust	Hospital / ED department	ED Footfall	As % of total	Sample Size
BHSCT	Royal Victoria Hospital	98,480	14.48%	52
	Mater Hospital	50,856	7.48%	27
NHSCT	Antrim Area Hospital	87,430	12.85%	46
	Causeway Hospital	46,035	6.77%	24
SET	Ulster Hospital	98,908	14.54%	52
	Lagan Valley Hospital	25,550	3.76%	14
	Downe Hospital	23,710	3.49%	13
SHSCT	Craigavon Area Hospital	89,570	13.17%	47
	Daisy Hill Hospital	56,248	8.27%	30
WHSCT	Altnagelvin Hospital	67,668	9.95%	36
	South West Acute Hospital	35,809	5.26%	19
		680,264	100%	360

5.3 Data source

The data source used for the audit was the Patient Administration System (PAS), which allowed the project team to identify patient case notes.

5.4 Audit type

The audit was retrospective and based on review of patient case notes.

5.5 Data collection methods

Data collectors were identified within each HSCT, and following training on the use of the data collection tools, the data was collected and entered onto a Microsoft Excel spreadsheet. The information on the spreadsheet was anonymised before being sent to the PHA project manager for data cleansing and analysis.

5.6 Data collectors and training

Data collectors attended a training session, where they were presented with an overview of the project, audit standards and methodology involved. They examined sample patient clinical notes and made data entries into the data collection tool. Any issues identified in this process were taken into account in the final revision of the data collection tool. To support the data collectors during the data collection process, the PHA project manager was available to deal with any queries or issues.

5.7 Data analysis

All HSCTs completed the required data collection and sent the anonymised data to the PHA project manager, who collated all returns onto one master database. The PHA project manager then cleansed all data for analysis and produced results for inclusion in the audit report.

5.8 Exclusions

In relation to the emergency department audit, 2 units (Lagan Valley Hospital ED and Daisy Hill ED), were unable to submit data to be included within the audit.

6. Findings

6.1 Inpatient Audit

Distribution of patients by gender

Figure 1: Distribution of patients by gender, regionally

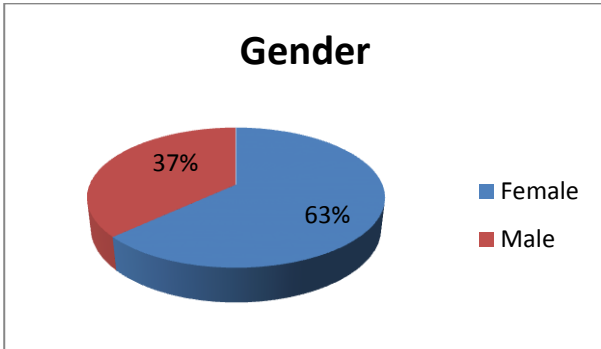


Figure 1 demonstrates the percentage of males and females regionally who were included in the audit. There were 108 females (63%) and 63 males (37%) across the region. For HSCT-level results, please see the technical report.

Distribution of patients by age group

Figure 2: Distribution of patients by age group, regionally

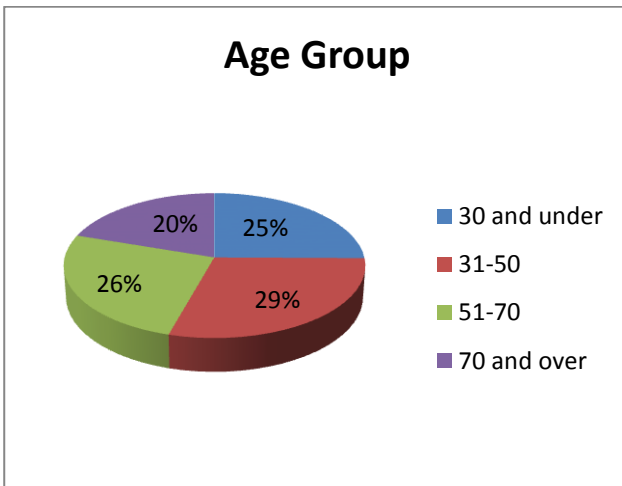


Figure 2 show the age breakdown of these patients across the region. Patients were fairly evenly divided between the four age categories, with the largest proportion, 29% (50 of 171) in the 31-50 age category, and the smallest proportion, 20% (34 of 171) in the 70+ category. For HSCT-level results, please see the technical report.

Smoking status

Table 1: Patient smoking status, by HSCT

TRUST	Current smoker		E-cigarettes only		Ex-smoker		Never smoked		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	Count	%	
BHSCT	14	33%	0	0%	8	19%	16	38%	4	10%	42
NHSCT	4	13%	0	0%	1	3%	18	60%	7	23%	30
SET	18	42%	0	0%	11	26%	14	33%	0	0%	43
SHSCT	5	19%	0	0%	2	8%	14	54%	5	19%	26
WHSCT	7	26%	1	4%	7	26%	10	37%	2	7%	27
Total	48	29%	1	1%	29	17%	72	43%	18	11%	168

NB: Question left blank in 3 cases, hence total of 168

Table 1 demonstrates the smoking status of patients included in the audit. Overall, 29% (48 of 168) of patients are current smokers. The highest proportion of smokers was from SET at 42% (18 of 43) and the lowest was from NHSCT at 13% (4 of 30).

Percentage of patients who did not have evidence of a previous asthma diagnosis

Table 2: Evidence regarding previous diagnosis of asthma by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	39	89%	4	9%	1	2%	44
NHSCT	26	87%	4	13%	0	0%	30
SET	35	81%	7	16%	1	2%	43
SHSCT	26	100%	0	0%	0	0%	26
WHSCT	25	93%	2	7%	0	0%	27
Total	151	89%	17	10%	2	1%	170

NB: Question left blank in 1 case, hence total of 170

Table 3: Patients without evidence of previous diagnosis of asthma, by age breakdown, by HSCT

TRUST	30 and under		31-50		51-70		70 and over		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	0	0%	3	75%	0	0%	1	25%	4
NHSCT	0	0%	1	25%	1	25%	2	50%	4
SET	1	14%	2	29%	3	43%	1	14%	7
WHSCT	1	50%	0	0%	0	0%	1	50%	2
Total	2	12%	6	35%	4	24%	5	29%	17

Table 2 demonstrates that 89% (151 of 170) of patients had a previous diagnosis of asthma. Table 3 illustrates the remaining 11% for whom no evidence was available of a previous diagnosis of asthma. These patients were distributed evenly between age groups.

Patient's most recent previous admission to hospital for asthma

Figure 3: Most recent previous asthma admission, regionally

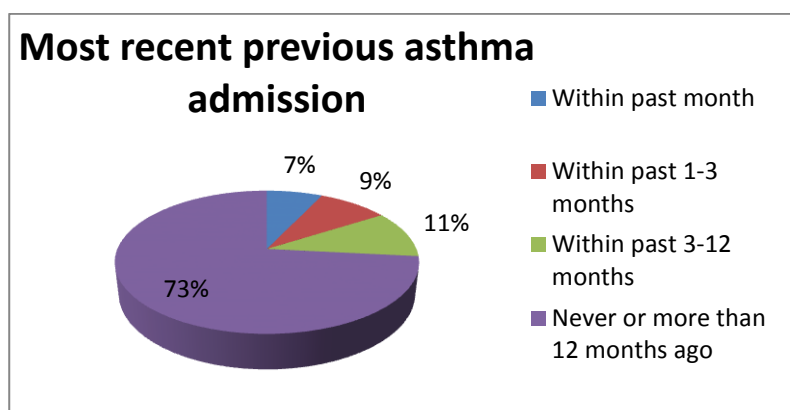


Figure 3 show that for the majority of patients, 73% (124 of 169), their most recent previous admission to hospital for asthma was either 'never' or more than 12 months ago. However over, a quarter of patients had an admission within the last year. Eleven percent (18 of 169) had been admitted within the past 3-12 months, with the remaining 16% (27 of 169) having had admissions within the previous 3 months. Seven percent (12 of 169) were readmitted within one month. For HSCT-level results, please see the technical report.

Patients who have had previous asthma admissions to intensive care

Table 4: Previous admissions to intensive care for asthma, By HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT*	2	5%	28	64%	14	32%	44
NHSCT	2	7%	17	59%	10	34%	29
SET	2	5%	32	74%	9	21%	43
SHSCT	1	4%	18	75%	5	21%	24
WHSCT	3	11%	24	89%	0	0%	27
Total	10	6%	119	71%	38	23%	167

NB: Question left blank in 4 cases, hence total of 167

** Patients in BCH may have been electively admitted from difficult asthma clinic and previous admission to intensive care will have been noted there*

Table 4 illustrates the percentage of patients who had previous admissions to intensive care with asthma. This information was available for 77% (129 of 167) of patients. Six percent (10 of 167) of patients had had previous intensive care admissions.

Patients admitted under the care of / reviewed by the respiratory medical team

Table 5: Patients under the care of / reviewed by the respiratory medical team, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	34	76%	11	24%	45
NHSCT	26	87%	4	13%	30
SET	28	65%	15	35%	43
SHSCT	12	46%	14	54%	26
WHSCT	17	63%	10	37%	27
Total	117	68%	54	32%	171

Table 5 illustrates the proportion of patients who were admitted under the care of / reviewed by the respiratory medical team. Overall, 68% (117 of 171) of patients audited had been admitted under the care of or reviewed by the respiratory team. Trust-level results ranged from 46% (12 of 26) for SHSCT, to 87% (26 of 30) for NHSCT.

Patients discharged from a respiratory ward / designated respiratory area

Table 6: Patients who were discharged from a respiratory ward or designated area, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	27	60%	18	40%	45
NHSCT	17	57%	13	43%	30
SET	24	56%	19	44%	43
SHSCT	5	19%	21	81%	26
WHSCT*	10	37%	17	63%	27
Total	83	49%	88	51%	171

*South West Acute Hospital (SWAH) in WHSCT does not have a respiratory ward

Table 6 illustrate the proportion of patients who were either discharged from a respiratory ward or else a designated respiratory area within a ward. Overall 49% (83 of 171) of patients were discharged from a respiratory ward. Trust-level results ranged from 19% (5 of 26) for SHSCT to 60% (27 of 45) for BHSCT.

Patients seen by the respiratory nurse during their admission

Table 7: Patients who were seen by a respiratory nurse, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	20	44%	25	56%	45
NHSCT	18	60%	12	40%	30
SET	27	63%	16	37%	43
SHSCT	12	48%	13	52%	25
WHSCT	5	19%	22	81%	27
Total	82	48%	88	52%	170

NB: Question left blank in 1 case, hence total of 170

Table 7 illustrates those patients who were seen by the respiratory nurse during their admission. Overall, just under half, 48% (82 of 170) were seen, with Trust-level results ranging from 19% (5 of 27) for Western Health and Social Care Trust (WHSCT), to 63% (27 of 43) for SET.

Patients not under the care of / reviewed by a respiratory team, who were seen by a respiratory nurse

Table 8: Patients not seen by respiratory team, who were seen by respiratory nurse, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT*	1	9%	10	91%	11
NHSCT	0	0%	4	100%	4
SET	6	40%	9	60%	15
SHSCT	5	36%	9	64%	14
WHSCT	0	0%	10	100%	10
Total	12	22%	42	78%	54

** Patients in BCH may have been seen by a respiratory nurse prior to admission at the difficult asthma clinic*

Table 8 illustrates the proportion of those patients who were not under the care of / reviewed by the respiratory team, but who were seen by the respiratory nurse prior to discharge. A total of 54 patients were not reviewed by the respiratory team, and of this cohort, 22% (12 of 54) were seen by a respiratory nurse. Considering Trust-level results, SET had the highest rate, 40% (6 of 15), with both NHSCT and WHSCT having none of this cohort of patients being seen by a respiratory nurse. This means that a total of 42 people (54 minus 12) were not seen by any member of the respiratory team during their admission, and later on in this report, we will analyse and compare discharge outcomes for this cohort of patients.

The recording of peak flow on first presentation and post bronchodilation

The audit also looked at the recording of peak flow on first presentation and post bronchodilation. 45% (76 of 169) of patients had peak flow measured on first presentation. This ranged between 30% (13 of 43) in SET and 59% (26 of 44) in BHSCT. Of these patients, 57% (43 of 76) also had peak flow measured post bronchodilation, with the WHSCT having the highest proportion at 64% (9 of 14) and the SHSCT having the lowest at 50% (6 of 12). Of those patients who had peak flow measured on first presentation, 33% (25 of 76) did not have a record in their notes of peak flow measurement post-bronchodilation. Please see the technical report.

The measurement and administration of oxygen during admission and the performing of ABGs

The audit also looked at the number of patients who had oxygen saturation measured on admission. There was evidence that this was measured in 99% (169 of 170) of patients with only one patient for whom there was no record in the notes.

In relation to the percentage of patients who received oxygen during the inpatient stay, regionally, this figure was 44% (75 of 169), with Trust-level results ranging from 33% (15 of 45) in BHSCT to 56% (24 of 43) in SET. The percentage of patients who did not receive oxygen during their stay was 53% (89 of 169). Please see the technical report.

The provision of oxygen to patients whose SpO2 was under 94%

Table 9: Those whose O2 stats were under 94%, who received oxygen, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	9	53%	7	41%	1	6%	17
NHSCT	8	80%	2	20%	0	0%	10
SET	16	89%	2	11%	0	0%	18
SHSCT	7	100%	0	0%	0	0%	7
WHSCT	3	75%	1	25%	0	0%	4
Total	43	77%	12	21%	1	2%	56

Table 9 illustrates the percentage of patients who had a measured SpO2 of less than 94%, and whether they did or did not have oxygen provided. 77% (43 of 56) patients had oxygen provided with SpO2 of less than 94%. Results ranged from 53% (9 of 17) in BHSCT to 100% (7 of 7) in SHSCT.

Arterial Blood Gas (ABG)

The audit also looked at the performing of ABGs. For patients with oxygen saturations of <92%, 78% (77 of 99) had an ABG performed. 16% (6 of 99) of patients did not have an ABG performed, and for 6% of patients there was no record in the notes. Of the patients that did not have an ABG performed, the highest proportion was from NHSCT at 41% (9 of 22). Please see the technical report.

The provision and timeframe of corticosteroids during admission

The audit also looked at the provision and timeframe of corticosteroids during the inpatient stay, and found that the majority of patients, 94% (159 of 169), received corticosteroids during their stay in hospital. When looking at timeframes for provision of these, 60% of patients (94 of 156) were found to have received these prior to admission to the ward, with a further 14% (22 of 156) within the first hour of admission. There was an almost even split between the remaining patients who received them within 4 hours, and those who received them within 4-24 hours at 12% (18 of 156) and 11% (17 of 156) respectively. The remaining 3% (5 of 156) did not receive steroids until 24 hours or more after admission. Please see the technical report.

PEF results prior to discharge

Table 10: Prior to discharge, was PEF >75% best or predicted and PEF diurnal variation <25%? By HSCT

TRUST	Yes		No, but resp physician allowed discharge		No		Not documented		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	16	36%	4	9%	7	16%	17	39%	44
NHSCT	8	31%	5	19%	2	8%	11	42%	26
SET	16	37%	8	19%	3	7%	16	37%	43
SHSCT	8	32%	1	4%	6	24%	10	40%	25
WHSCT	10	37%	0	0%	0	0%	17	63%	27
Total	58	35%	18	11%	18	11%	71	43%	165

NB: Question left blank in 6 cases, hence total of 165

Table 10 represents the percentage of patients who had PEF >75% best or predicted and PEF diurnal variation <25% prior to discharge. 46% (76 of 165) of patients had met the desired PEF value prior to discharge, or did not but discharge was agreed with a respiratory consultant. Of note, PEF prior to discharge was not documented in a high percentage of patients at 43% (71 of 165), with highest levels of non-documentation in the WHSCT at 63% (17 of 27).

Critical care review

Table 11: Patients reviewed by a member of the critical care team, by HSCT

TRUST	Yes - admitted to critical care		Yes - advice given		Yes - No action		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	Count	%	
BHSCT	1	3%	3	8%	0	0%	36	90%	0	0%	40
NHSCT	1	4%	1	4%	0	0%	21	81%	3	12%	26
SET	1	2%	1	2%	0	0%	41	95%	0	0%	43
SHSCT	0	0%	1	4%	0	0%	22	85%	3	12%	26
WHSCT	2	7%	2	7%	1	4%	20	74%	2	7%	27
Total	5	3%	8	5%	1	1%	140	86%	8	5%	162

NB – Question left blank in 9 cases, hence total of 162

Table 11 illustrates the percentage of patients who were reviewed by a member of the critical care team. Overall, critical care reviewed 9% (14 of 162) of patients with 5 of these reviews resulting in critical care admission.

Table 12: The most recent previous admissions for those patients who were reviewed by a member of the critical care team, by HSCT

TRUST	Within past month		Within past 1-3 months		Within past 3-12 months		Never / more than 12 months ago		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	0	0%	2	50%	1	25%	1	25%	4
NHSCT	0	0%	1	50%	0	0%	1	50%	2
SET	1	50%	0	0%	0	0%	1	50%	2
SHSCT	0	0%	0	0%	0	0%	1	100%	1
WHSCT	1	20%	2	40%	1	20%	1	20%	5
Total	2	14%	5	36%	2	14%	5	36%	14

Table 12 illustrates that half of the patients (7 of 14) who were reviewed by critical care had a previous admission within the last 3 months.

The use of inhaled corticosteroids prior to admission and provision / increase of these before discharge

Table 13: Patients taking inhaled corticosteroids regularly prior to admission, by HSCT

TRUST	Yes		No - beta agonist / Montelukast only		No - new diagnosis		No - poor concordance		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	Count	%	
BHSCT	24	56%	4	9%	5	12%	4	9%	6	14%	43
NHSCT	28	93%	0	0%	1	3%	0	0%	1	3%	30
SET	38	88%	1	2%	2	5%	2	5%	0	0%	43
SHSCT	17	65%	4	15%	0	0%	4	15%	1	4%	26
WHSCT	20	74%	1	4%	3	11%	1	4%	2	7%	27
Total	127	75%	10	6%	11	7%	11	7%	10	6%	169

NB – Question left blank in 2 cases, hence total of 169

Table 13 describes ICS use prior to admission. The majority of patients, 75% (127 of 169), were already on ICS before their admission to hospital. Regionally 7% (11 of 169) were not taking inhaled corticosteroids prior to admission due to poor concordance with the highest level of poor concordance seen in SHSCT at 15% (4 of 26). In 6% (10 of 169) of cases there was no documentation in the notes of ICS history, with the highest rate of non-documentation being in patients from the BHSCT, 14% (6 of 43). Seven percent (11 of 169) of patients were newly diagnosed and not taking ICS prior to admission.

The audit also looked at the cohort of patients who were already using ICS, who went on to have these increased during their inpatient stay. 19% (23 of 118) had their ICS increased during their stay. There was evidence that the majority, 70% (83 of 118) had not had their ICS increased, whilst for the remaining 10%, it was not indicated.

The audit also analysed the cohort of patients who were only on beta agonists or montelukast prior to admission who were commenced on ICS during their stay. 70% (7 of 10) of patients in this cohort were commenced on ICS prior to discharge.

Finally, the audit looked at the cohort of patients who were not already taking ICS due to the asthma being newly diagnosed during the admission. This question was answered in 9 of 11 cases. Of these 9 patients, all were started on ICS prior to discharge.

Please see the technical report for full results.

The provision of oral steroids during admission and on discharge

Table 14: Patients who were sent home on oral steroids, or had already received 5 days of steroids before discharge, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	41	91%	3	7%	1	2%	45
NHSCT	26	90%	3	10%	0	0%	29
SET	43	100%	0	0%	0	0%	43
SHSCT	22	85%	3	12%	1	4%	26
WHSCT	21	78%	6	22%	0	0%	27
Total	153	90%	15	9%	2	1%	170

NB – Question left blank in 1 case, hence total of 170

Table 14 shows patients being treated with oral steroids in hospital and/or being prescribed them upon discharge. The table illustrates that 90% (153 of 170) of patients received 5 days of oral steroids. Trust-level results show that SET had the highest percentage, at 100% (43 of 43), whilst WHSCT had the lowest rate, at 78% (21 of 27).

Discharge – Inhaler technique

Table 15: Patients who had their inhaler technique checked prior to discharge, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	16	36%	7	16%	22	49%	45
NHSCT	19	63%	6	20%	5	17%	30
SET	26	60%	12	28%	5	12%	43
SHSCT	8	32%	9	36%	8	32%	25
WHSCT	7	26%	10	37%	10	37%	27
Total	76	45%	44	26%	50	29%	170

NB – Question left blank in 1 case, hence total of 170

Table 16: If technique was checked, what was quality of technique? By HSCT

TRUST	Good		Initially poor, improved with education		Poor and needed change in inhaler		No comment on technique		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	8	50%	6	38%	1	6%	1	6%	16
NHSCT	14	74%	2	11%	0	0%	3	16%	19
SET	8	31%	12	46%	3	12%	3	12%	26
SHSCT	5	63%	2	25%	0	0%	1	13%	8
WHSCT	2	29%	0	0%	1	14%	4	57%	7
Total	37	49%	22	29%	5	7%	12	16%	76

Table 15 describes the percentage of patients who had their inhaler technique checked before discharge. Regionally there was documented evidence of inhaler technique check completion in 45% (76 of 170) of patients. This was not recorded in 29% (50 of 170) and was recorded as being not completed at all in 26% (44 of 170) of patients. The NHSCT had the highest proportion of patients with inhaler technique checked at 63% (19 of 30), whereas the lowest proportion was seen in the WHSCT at 26% (7 of 27). Table 16 shows that, of those who had their inhaler technique assessed, it was good in 49% of patients (37 of 76). 29% (22 of 76) had poor technique which improved following education. The remaining 7% of patients needed a different inhaler device to improve symptom control.

Table 17: Those patients not seen by any member of the respiratory team, who had their inhaler technique checked, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	1	10%	3	30%	6	60%	10
NHSCT	0	0%	3	75%	1	25%	4
SET	2	22%	5	56%	2	22%	9
SHSCT	0	0%	5	63%	3	38%	8
WHSCT	1	10%	7	70%	2	20%	10
Total	4	10%	23	56%	14	34%	41

NB – Question left blank in 1 case, hence total of 41

By comparison, table 17 considers whether inhaler technique was checked in patients who were not seen by any member of the respiratory team. This was much lower in comparison to the percentage for the whole audit sample, at only 10% (4 of 41).

Discharge – Medication assessment, including adherence review, and addressing poor compliance

Table 18: Patients who had a medication assessment, including adherence review, prior to discharge, by HSCT

TRUST/Hospital	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	12	29%	7	17%	23	55%	42
NHSCT	14	47%	5	17%	11	37%	30
SET	27	63%	3	7%	13	30%	43
SHSCT	20	77%	1	4%	5	19%	26
WHSCT	7	26%		0%	20	74%	27
Total	80	48%	16	10%	72	43%	168

Table 19: For those who had a medication assessment, if the patient was poorly compliant, were reasons for this addressed with the patient? By HSCT

TRUST	Yes		No		N/a		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	5	50%	0	0%	0	0%	5	50%	10
NHSCT	5	50%	1	10%	0	0%	4	40%	10
SET	11	41%	2	7%	4	15%	10	37%	27
SHSCT	6	67%	1	11%	0	0%	2	22%	9
WHSCT	2	33%	0	0%	0	0%	4	67%	6
Total	29	47%	4	6%	4	6%	25	40%	62

NB: Question left blank in 18 cases, hence total of 62

Table 18 describes the percentage of patients who received a medication assessment including a review of adherence prior to discharge. There was evidence that this was completed for 48% of patients regionally (80 of 168) however for another 41% (69 of 168) of patients this was not recorded in the notes. In 10% of cases (16 of 168) this was not completed. The results varied widely between Trusts, ranging between 77% of patients receiving a medication review in the SHSCT (20 of 26) and 26% (7 of 27) in the WHSCT.

Table 19 demonstrates the actions that were taken for those patients who had received a review, if the patient was shown to have poor concordance. Of note, this table demonstrates that 62 of 80 patients who had received a medication assessment were deemed to have poor concordance. There was evidence that reasons for this were addressed with the patient in 47% of cases (29 of 62), with a large proportion of patients having no record of whether this was addressed or not at 40% (25 of 62).

Table 20: Those patients not seen by any member of the respiratory team, who had a medication assessment, including review, carried out, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	2	22%	3	33%	4	44%	9
NHSCT	1	25%	1	25%	2	50%	4
SET	2	22%	2	22%	5	56%	9
SHSCT	4	44%	0	0%	5	56%	9
WHSCT	2	20%	0	0%	8	80%	10
Total	11	27%	6	15%	24	59%	41

NB – Question left blank in 1 case, hence total of 41

By comparison, table 20 illustrates the percentage of patients who were not seen by any member of the respiratory team, who had a medication assessment prior to discharge. This was lower than that for the whole audit sample at only 27% (11 of 41).

Discharge – The provision of a written personal asthma action plan (PAAP) and consideration of triggers and exacerbating factors

Table 21: Patients who were provided with a written personal asthma action plan prior to discharge, by HSCT

TRUST	Yes		Already has a plan		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	12	28%	2	5%	8	19%	21	49%	43
NHSCT	18	60%	0	0%	7	23%	5	17%	30
SET	12	28%	4	9%	18	42%	9	21%	43
SHSCT	8	31%	6	23%	4	15%	8	31%	26
WHSCT	3	11%	1	4%	12	44%	11	41%	27
Total	53	31%	13	8%	49	29%	54	32%	169

NB – Question left blank in 2 cases, hence total of 169

Table 22: Were triggers and exacerbating factors considered for those who had a plan or had one updated? By HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	11	79%	0	0%	3	21%	14
NHSCT	11	61%	1	6%	6	33%	18
SET	14	88%	0	0%	2	13%	16
SHSCT	7	54%	2	15%	4	31%	13
WHSCT	4	100%	0	0%	0	0%	4
Total	47	72%	3	5%	15	23%	65

NB – Question left blank in 1 case, hence total of 65

Table 23: Were triggers and exacerbating factors considered for those who did not have a plan or had one updated, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	6	21%	5	18%	17	61%	28
NHSCT	2	17%	5	42%	5	42%	12
SET	5	19%	10	37%	12	44%	27
SHSCT	1	8%	1	8%	10	83%	12
WHSCT	18	78%	1	4%	4	17%	23
Total	32	31%	22	22%	48	47%	102

NB – Question left blank in 1 case, hence total of 102

Table 21 looks at the use of a written PAAP in relation to inpatient asthma care. Of the 169 who answered this question, there was evidence that 31% (53 of 169) had received a written PAAP prior to discharge. A further eight percent (13 of 169) already had a plan prior to admission. Of the remaining patients (61%), 29% (49 of 169) did not had a plan provided, and 32% (54 of 169) it had not been recorded whether or not a plan had been provided. Trust-level results indicate NHSCT as the Trust with the highest percentage of written discharge care plan provision, at 60% (18 of 30) with WHSCT having the lowest rate, at 11% (3 of 27).

Table 22 shows that, for those patients who had a plan or had one updated, triggers and exacerbating factors were considered in 72% of cases (47 of 65), with WHSCT having the highest percentage at 100% (4 of 4) and SHSCT the lowest at 54% (7 of 13).

In comparison, table 23 shows that, for those patients who did not have a plan, triggers and exacerbating factors were considered in only 31% of cases (32 of 102). Trust level results ranged widely, with WHSCT the highest at 78% (18 of 23), and SHSCT the lowest at 8% (1 of 12).

Table 24: Those patients not seen by any member of the respiratory team, who were provided with a written personal asthma action plan, or had one provided, by HSCT

TRUST	Yes		Already has a plan		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	0	0%	0	0%	5	50%	5	50%	10
NHSCT	0	0%	0	0%	3	75%	1	25%	4
SET	1	11%	0	0%	5	56%	3	33%	9
SHSCT	0	0%	2	22%	2	22%	5	56%	9
WHSCT	0	0%	0	0%	8	80%	2	20%	10
Total	1	2%	2	5%	23	55%	16	38%	42

By comparison, table 24 demonstrates that, of the 42 patients who were not seen by any member of the respiratory team, only 7% (3 of 42) received a PAAP.

Discharge - GP informed within 24 hours of discharge

Table 25: Patients whose GP was informed regarding their admission, within 24 hours of discharge, by HSCT

TRUST	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	13	30%	31	70%	0	0%	44
NHSCT	3	10%	26	90%	0	0%	29
SET	10	23%	32	74%	1	2%	43
SHSCT	1	4%	25	96%	0	0%	26
WHSCT	4	15%	23	85%	0	0%	27
Total	31	18%	137	81%	1	1%	169

NB – Question left blank in 2 cases, hence total of 169

Table 25 looks at the percentage of patients for whom GP practices were informed about their hospital admission within 24 hours of discharge. Regionally there was evidence of this in only 18% of patients (31 of 169). The highest percentage of patients whose GPs were informed of their admission was in BHSCT at 30% (13 of 44) and the lowest was in SHSCT Trust at 4% (1 of 26).

Table 26: Those patients not seen by any member of the respiratory team, who's GP was informed about their hospital admission within 24 hours of discharge, by HSCT

Trust / Hospital	Yes		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	
BHSCT	0	0%	9	100%	0	0%	9
NHSCT	0	0%	4	100%	0	0%	4
SET	1	11%	7	78%	1	11%	9
SHSCT	0	0%	9	100%	0	0%	9
WHSCT	1	10%	9	90%	0	0%	10
Total	2	5%	38	93%	1	2%	41

NB – Question left blank in 1 case, hence total of 41

By comparison, table 26 illustrates, for the 42 patients who were not seen by any member of the respiratory team, GPs were informed within 24 hours for only 5% (2 of 41).

Discharge - Community review with patient's GP practice

Table 27: Patients who had a community review appointment with their GP practice scheduled prior to discharge, by HSCT

TRUST	Yes within 2 working days		No, but documented evidence that patient advised to attend GP practice		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	5	12%	7	17%	7	17%	23	55%	42
NHSCT	2	7%	7	25%	15	54%	4	14%	28
SET	2	5%	14	33%	13	30%	14	33%	43
SHSCT	0	0%	1	4%	23	88%	2	8%	26
WHSCT	2	7%	5	19%	8	30%	12	44%	27
Total	11	7%	34	20%	66	40%	55	33%	166

NB – Question left blank in 5 cases, hence total of 166

In terms of community review, table 27 demonstrates the percentage of patients who prior to discharge had a follow-up appointment arranged with their GP or asthma nurse within 2 working days or who were advised to attend their GP practice for review. For 7% of patients (11 of 166) this was arranged with their GP, and the majority of these patients were in BHSCT. 20% of patients (34 of 166) were advised to see their GP. For 73% of patients (121 of 166) this was either not completed or there was no record of it being organised. This was the case for 96% (25 of 26) of patients in the SHSCT.

Table 28: Those patients not seen by any member of the respiratory team, who had a community review appointment with their GP practice scheduled before discharge, by HSCT

TRUST	Yes within 2 working days		No, but documented evidence that patient advised to attend GP practice		No		Not recorded		Total Count
	Count	%	Count	%	Count	%	Count	%	
BHSCT	0	0%	0	0%	4	50%	4	50%	8
NHSCT	0	0%	1	25%	2	50%	1	25%	4
SET	1	11%	3	33%	2	22%	3	33%	9
SHSCT	0	0%	0	0%	8	89%	1	11%	9
WHSCT	1	10%	2	20%	5	50%	2	20%	10
Total	2	5%	6	15%	21	53%	11	28%	40

NB – Question left blank in 2 cases, hence total of 40

By comparison, table 28 illustrates that, of those patients who were not reviewed by respiratory, only 5% (2 of 40) had a review appointment with the GP within 2 days organised prior to discharge.

Discharge - Was hospital follow-up arranged?

Table 29: Patients who had hospital follow-up arranged prior to discharge, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	30	67%	15	33%	45
NHSCT	24	80%	6	20%	30
SET	24	56%	19	44%	43
SHSCT	21	81%	5	19%	26
WHSCT	15	56%	12	44%	27
Total	114	67%	57	33%	171

Table 29 describes the percentage of patients who had hospital follow-up arranged prior to discharge. In 67% of patients (114 of 171) there was evidence that this had been arranged. NHSCT and the SHSCT had the highest rates, with 80% and 81% of patients having this review arranged before discharge respectively.

Table 30: Those patients not seen by any member of the respiratory team, who had hospital follow-up arranged prior to discharge, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	1	10%	9	90%	10
NHSCT	2	50%	2	50%	4
SET	3	33%	6	67%	9
SHSCT	6	67%	3	33%	9
WHSCT	0	0%	10	100%	10
Total	12	29%	30	71%	42

By comparison, table 30 shows that, for the 42 people who were not reviewed by respiratory, a smaller percentage of them, 29% (12 of 42) had hospital follow up arranged.

Discharge - Timeframe for hospital follow up

Table 31: Timeframe for follow up, by HSCT

TRUST	Within 4 weeks		4 to 8 weeks		Over 8 weeks		Total Count
	Count	%	Count	%	Count	%	
BHSCT	7	23%	15	50%	8	27%	30
NHSCT	11	48%	7	30%	5	22%	23
SET	10	42%	5	21%	9	38%	24
SHSCT	5	24%	14	67%	2	10%	21
WHSCT	3	20%	6	40%	6	40%	15
Total	36	32%	47	42%	30	27%	113

NB – Question left blank in 1 case, hence total of 113

Table 31 illustrates the timeframe by which hospital follow-up was arranged. There was a fairly even divide between the three time-frames: within 4 weeks, 4 to 8 weeks and over 8 weeks. The highest percentage of patients at 42% (47 of 113) had a review arranged for between 4-8 weeks. NHSCT and SET arranged the highest percentage of reviews within 4 weeks, at 48% and 42% of patients respectively.

Summary of discharge planning outcomes – overall sample compared to those not seen by any member of the respiratory team

Table 32 below shows how many of the 6 discharge elements were provided to each of the 42 patients who were not seen by respiratory, with 50% (21 of 42) not receiving any of the 6 elements.

Further analysis in figures 4 and 5 overleaf summarise the 6 key elements of discharge planning outcomes for the 42 people not seen by respiratory, compared to the average.

Table 32: Numbers of asthma care elements provided to those patients not seen by any member of the respiratory team, by Trust

TRUST	0 elements		1 element		2 elements		3 elements		4 elements		Total Count
	Count	%	Count	%	Count	%	Count	%	Count	%	
BHSCT	7	70%	2	20%	1	10%	0	0%	0	0%	10
NHSCT	2	50%	1	25%	1	25%	0	0%	0	0%	4
SET	4	44%	2	22%	2	22%	0	0%	1	11%	9
SHSCT	1	11%	4	44%	4	44%	0	0%	0	0%	9
WHSCT	7	70%	2	20%	0	0%	1	10%	0	0%	10
Total	21	50%	11	26%	8	19%	1	2%	1	2%	42

Figure 4: Discharge planning elements – Total sample compared to those patients not seen by any member of the respiratory team

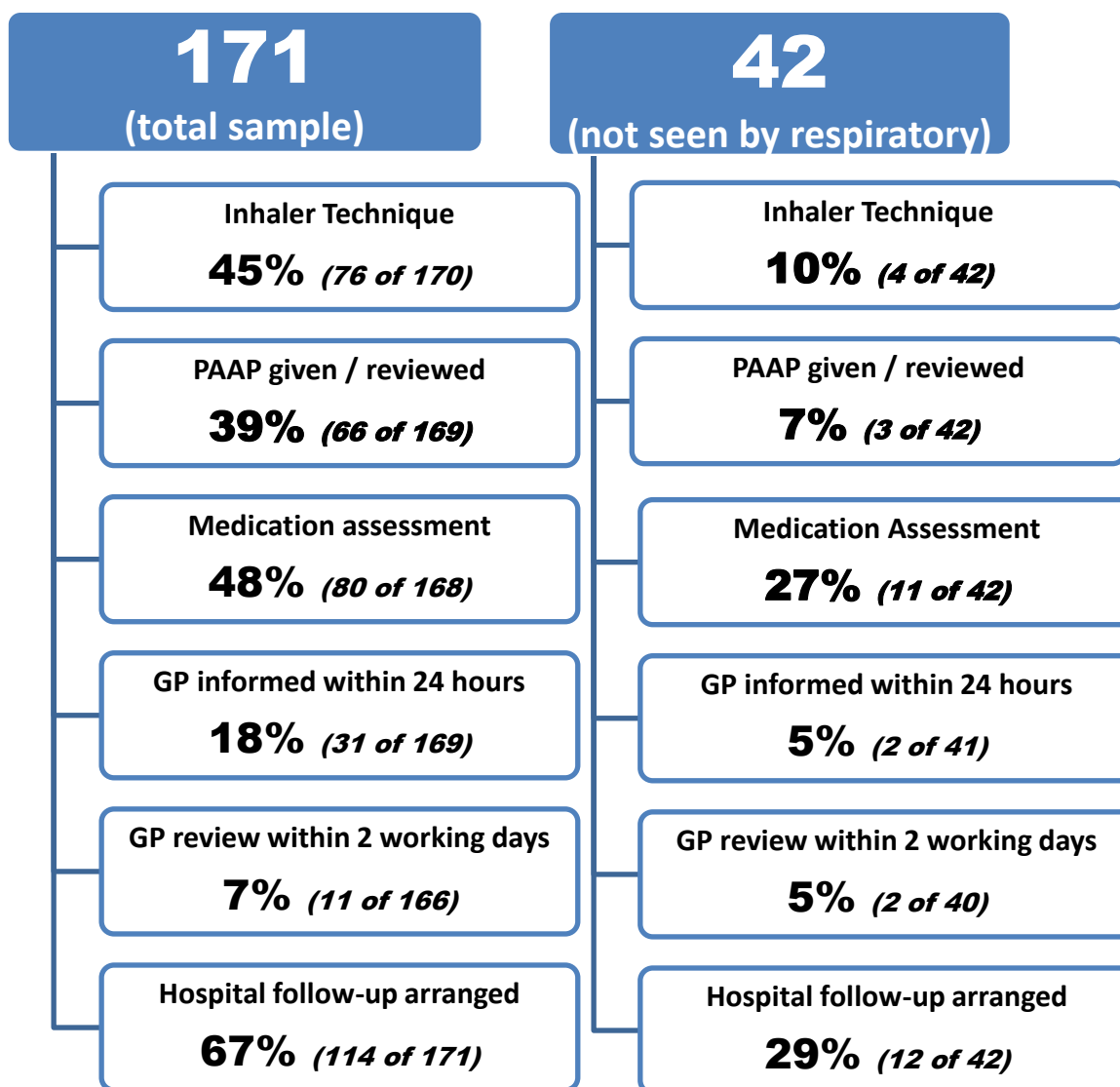
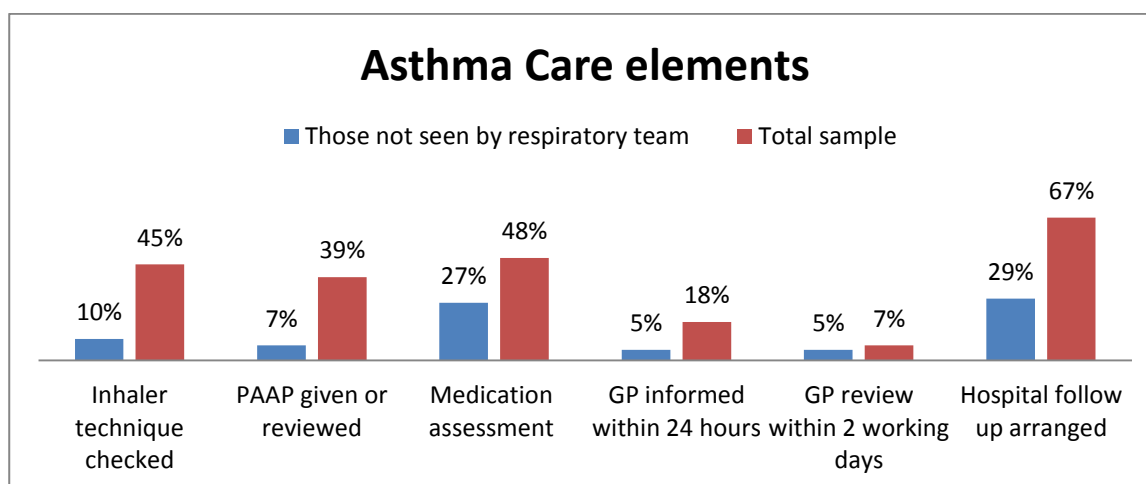


Figure 5: Discharge planning elements – Total sample compared to those patients not seen by any member of the respiratory team



6.2 ED Audit

Gender breakdown

Figure 6: Distribution of patients by gender, regionally

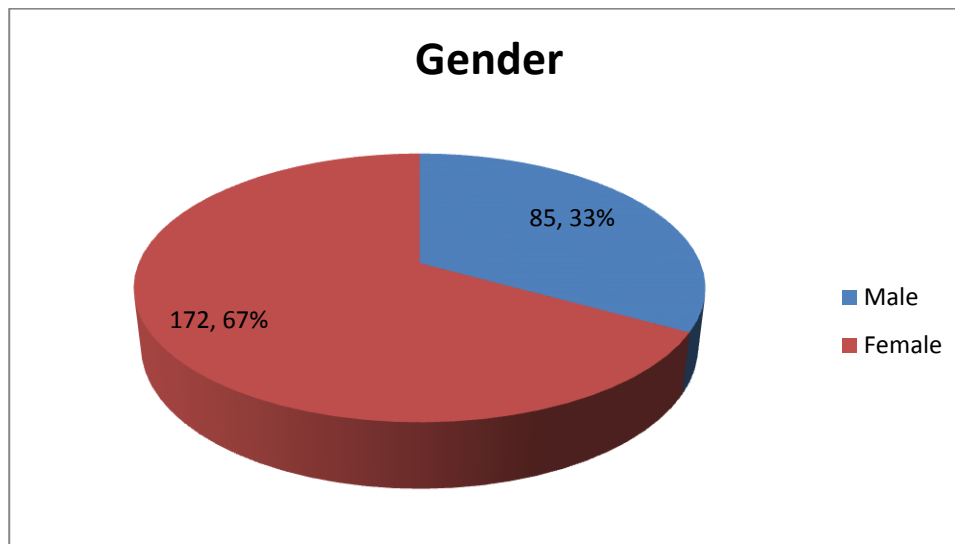


Figure 6 demonstrates the gender breakdown of patients who attended ED. The majority of patients were female at 67% (172 of 257). For HSCT-level results, please see the technical report.

Age breakdown

Figure 7: Distribution of patients by age group, regionally

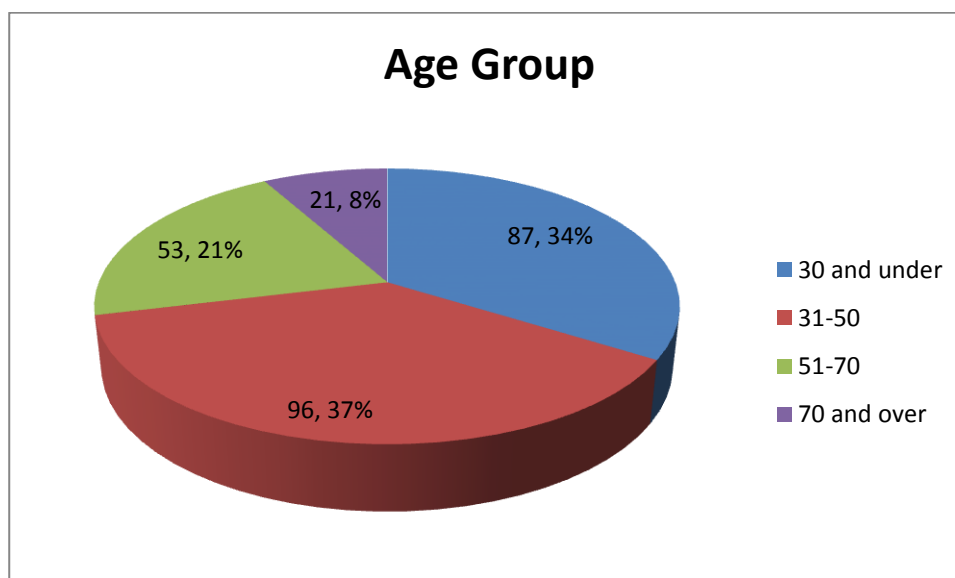
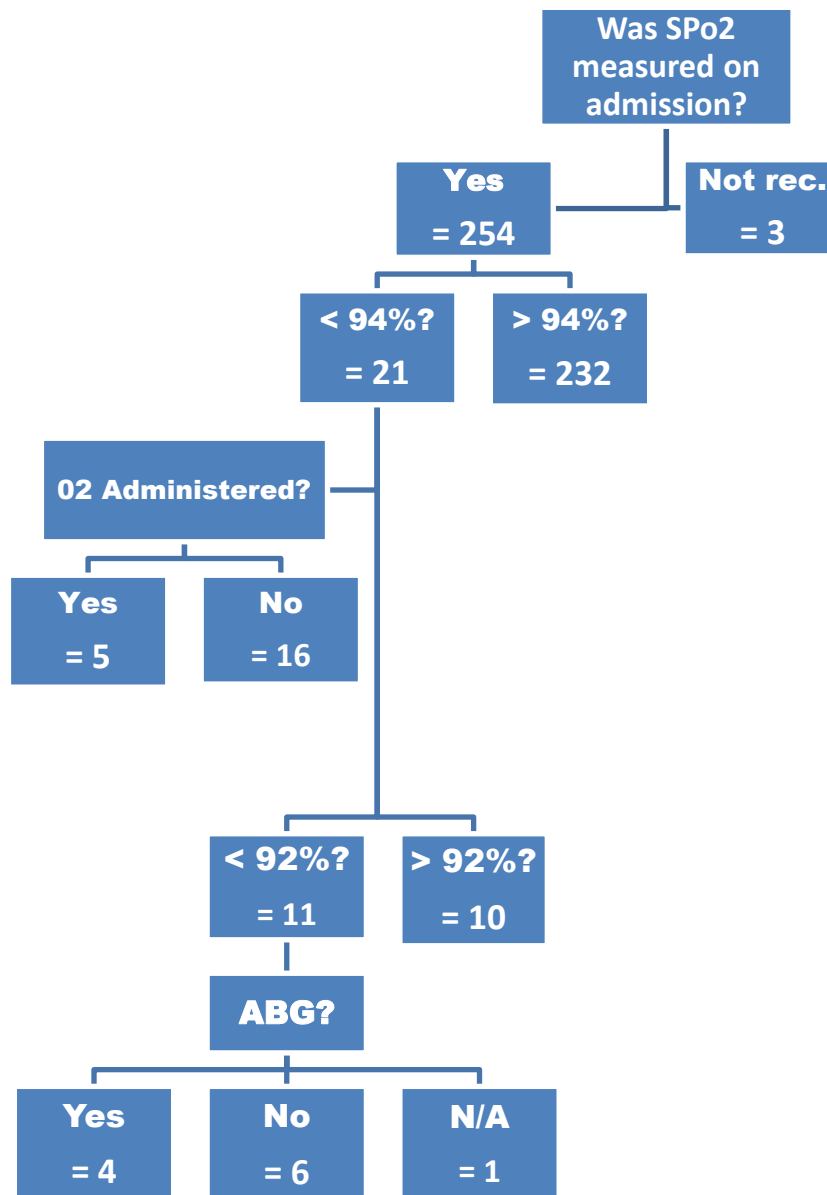


Figure 7 demonstrates the age breakdown of patients who attended ED. The 2 largest groups were the group aged 31 – 50, at 37% (96 of 257) and the group aged 30 and under, at 34% (87 of 257).

Was peripheral capillary oxygen saturation SpO2 measured on admission?

Figure 8: Flowchart illustrating oxygen outcomes, regionally



The flowchart above illustrates the percentage of patients who had peripheral capillary oxygen saturation (SpO₂) measured on admission. Almost all patients had this measured at 99% (254 of 257), with only 1% (3 of 257) for whom this was not recorded.

Of the 254 patients for whom SpO₂ was measured, 21 had SpO₂ of less than 94%. Of these 21, 5 had oxygen administered and 16 did not. 11 patients had SpO₂ less than 92% and of these patients, 4 had an ABG, 6 did not, and for 1 it was not applicable.

Peak Expiratory Flow (PEF) Measurement

Table 33: Patients who had PEF recorded, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	41	68%	19	32%	60
NHSCT	14	30%	33	70%	47
SET	14	27%	38	73%	52
SHSCT	11	22%	39	78%	50
WHSCT	30	86%	5	14%	35
Total	110	45%	134	55%	244

NB: Question left blank in 13 cases, hence total of 244

As illustrated in table 33, 45% (110 of 244) of patients had PEF first recorded, with highest results being in the WHSCT at 86% (30 of 35) and lowest in SHSCT at 22% (11 of 50). 36% (39 of 108) of these patients had post-bronchodilator PEF carried out, 46% (50 of 108) did not and it was not recorded for 18% (19 of 108). BHSCT had the highest percentage of patients who had post-bronchodilator PEF carried out at 68% (28 of 41) whereas SET and WHSCT were both lowest at 0%.

Was GP informed within 24 hours of discharge?

Table 34: Patients whose GP was informed within 24 hours of discharge, by HSCT

TRUST	Yes		No		N/a		Total Count
	Count	%	Count	%	Count	%	
BHSCT	34	56%	27	44%	0	0%	61
NHSCT	3	10%	26	84%	2	6%	31
SET	1	2%	51	98%	0	0%	52
WHSCT	1	2%	40	98%	0	0%	41
SHSCT	1	2%	49	98%	0	0%	50
Total	40	17%	193	82%	2	1%	235

NB: question left blank in 22 cases, hence total of 235

Table 34 demonstrates the percentage of patients whose GP was informed of their presentation to ED. This occurred for 17% (40 of 235) of patients. Of those patients, the vast majority had been seen in BHSCT, at 56% (34 of 61). However, for 82% (193 of 235) of patients, the GP was not informed within 24 hours of discharge.

Is there evidence of review arrangements?

Table 35: Evidence of review arrangements, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	16	26%	45	74%	61
NHSCT	15	32%	32	68%	47
SET	17	33%	35	67%	52
WHSCT	10	24%	31	76%	41
SHSCT	15	30%	35	70%	50
Total	73	29%	178	71%	251

NB: Question left blank in 6 cases, hence total of 251

If yes, was early review arranged for within 14 days?

Table 36: Early review that was arranged for within 14 days, by HSCT

TRUST	Yes		No		Total Count
	Count	%	Count	%	
BHSCT	13	81%	3	19%	16
NHSCT	7	88%	1	13%	8
SET	11	65%	6	35%	17
WHSCT	6	60%	4	40%	10
SHSCT	8	100%	0	0%	8
Total	45	76%	14	24%	59

NB: Question left blank in 14 cases, hence total of 59

Tables 35 and 36 demonstrate the percentage of patients who had review arrangements made, and the percentage of those that were within a 14 day window. Only 29% (73 of 251) of patients who attended ED had evidence of review arrangements. Of those, 76% (45 of 59) were within a 14 day time frame.

7. Observations and Discussion

7.1 Inpatient Audit

7.1.1 Assessment at admission

The majority of patients in this audit were female, and this preponderance was seen across all five trusts in both the inpatient and ED audit. Asthma is more prevalent in females from age 13-14 onwards, and research has also shown a female preponderance in difficult-to-treat asthma patient cohorts, which may explain this finding.² It was concerning to discover that just under a third (29%; 48 of 168) of inpatients were current smokers. This is an alarming figure considering the negative impact that cigarette smoke has on lung function, need for rescue medications for acute episodes of asthma and long-term control with ICS.³ Every contact with asthma patients who smoke should be used as an opportunity to provide advice about the dangers of smoking and offer appropriate support to stop.

Ten percent (17 of 170) of patients had no evidence of a previous diagnosis of asthma. These patients were distributed evenly between age groups. This is likely explained by eosinophilic asthma which tends to present in patients aged 40 and over. Seven percent of patients had been readmitted within one month of discharge, and 27% of patients had had a previous admission in the last year. Furthermore, 50% (7 of 14) of patients reviewed by critical care during admission had had a previous admission with 3 months, which could indicate that their care was not optimised during their admission or following discharge.

There is evidence to suggest that self-management education prior to discharge can help to reduce readmissions³, indeed, self-management is a crucial aspect of asthma care which evidence has shown to reduce the use of emergency health care resources and improve markers of asthma control.³ A standardised discharge bundle across Trusts could help to ensure that before a patient is discharged their asthma care has been reviewed and optimised where necessary. Use of these bundles can in turn, improve a patient's ability to self-manage their condition in the community and prevent readmissions. This is a key recommendation resulting from this audit.

² British Thoracic Society Adult Asthma Audit 2012 Dr John Lindsay & Professor Liam Heaney

³ **SIGN 153 British guideline on the management of asthma** September 2016 <https://www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2016/>

PEF at initial assessment and post bronchodilation was poor regionally. PEF is a core investigation in the assessment of patients suffering acute severe asthma. It is an easy investigation to perform, and the result helps to assess a patient's initial response to treatment and informs the decision to admit.² In severe cases it can also help to indicate when intubation may be necessary. Consultation with clinical colleagues identified numerous barriers to PEF including limited availability and accessibility of peak flow meters and lack of staff awareness of the significance of the investigation. Other barriers include a lack of clarity regarding whose responsibility it is to perform PEF and at what stage of admission. Training staff to highlight the importance of the investigation and incorporation of PEF into an asthma care bundle could help to address these issues.

Patients who have oxygen saturations of <92% have a higher risk of hypercapnia - a feature of life threatening asthma detected on ABG.³ Guidance states that patients with SpO₂ <92% (irrespective of whether a patient is breathing air or added oxygen) or other features of life threatening asthma require an ABG.³ Just over three quarters of inpatients with SpO₂ of <92% had an ABG performed. It may be reasonable for patients with SpO₂<92% who are clinically well to not need this investigation, however it was still considered an important component of a standardised asthma care bundle.

Three quarters of patients were on ICS prior to admission. The 25% that were not consisted of patients being on β agonist/ montelukast only, having new diagnoses, lack of record in the notes or poor concordance. ICS are the most effective preventer drug for achieving overall treatment goals³; therefore it is encouraging that a high percentage of patients were taking them before admission. Of 11 new diagnoses there was evidence in 9 cases of the patient being started on ICS prior to discharge. This is encouraging as recent confidential enquiries into over 200 asthma deaths in the UK concluded that the majority of deaths occurred before admission to hospital, and many occurred in patients who had receive inadequate treatment with ICS and/or had inadequate objective monitoring of their asthma.¹ However, there were 3 patients who were only receiving montelukast/ β agonist on admission and were not started on ICS, so it would be useful to know if ICS were considered prior to discharge and there were reasons for not prescribing them in these cases.

KPI 23h states that 90% of people admitted with acute severe asthma on beta-2-agonist therapy only should be commenced on ICS, and this target was not met at only 70% (7 of 10) of those on beta-2-agonist therapy or montelukast only having been started on ICS. We must bear in mind however that these are small numbers and so we should be cautious when interpreting them. Another key finding was that this important aspect of the history was not recorded for 10 patients, which again highlights a need to improve record keeping and awareness of this component of the history.

7.1.2 Management in hospital

In the treatment of acute asthma, steroid therapy has been shown to reduce mortality, relapses, hospital admissions and requirement for β_2 agonist therapy.³ It is also known that the earlier steroids are administered, the better the clinical outcome is likely to be.³ For adults presenting to ED with acute severe asthma, BTS guidance advises that they should be treated with corticosteroids within one hour.³Error! Bookmark not defined. 74% of patients (116 of 156) in this audit received corticosteroids prior to admission or within 1 hour of admission. Five remaining patients did not receive corticosteroids until 24 hours or later.

Regional data showed that only 44% (75 of 169) of patients received oxygen during the inpatient stay. When examining this in terms of SpO₂, 77% (43 of 56) of patients with SpO₂ less than 94% had oxygen administered. It is recommended that controlled supplementary oxygen is given to all hypoxaemic patients with acute severe asthma titrated to maintain SpO₂ 94-98%.³ There are several possible explanations why not all patients with SpO₂ <94% received oxygen. It may be that oxygen was not recommended due to clinical reasons, it could be that the patient condition stabilised to the point that supplementary oxygen was no longer required, that oxygen administration is not routinely documented, or it could be that the admissions were short and oxygen was delivered in the ED rather than on the ward.

KPI 23g states that 80% of people with acute severe asthma admitted to hospital with an exacerbation should receive care from a respiratory team. Twenty five percent (42 of 171) of patients admitted with acute severe asthma were not admitted under the care of a respiratory team, reviewed by the respiratory team or reviewed by the respiratory nurse, and so this target was not met. It is important that patients admitted to hospital with acute severe asthma have a structured review by a member of the specialist

respiratory team before discharge as per NICE quality statement 9.³ Again, variation was evident between Trusts with only 46% (12 of 26) of patients being admitted under the care of a respiratory team in SHSCT in comparison to 87% (26 of 30) in the NHSCT. This may be due to different post-take medical consultant arrangements, respiratory workforce capacity or hospital admission duration and bed availability.

7.1.3 Patients who were not reviewed by any member of the respiratory team during admission

Audit data was analysed for the 42 patients who were not reviewed by any member of the respiratory team during admission. Several aspects of asthma management were completed less frequently in this group than on average. Figures 4 & 5 and table 32 summarises the percentage of patients who received various elements of asthma care, comparing the 42 patients who were not seen by respiratory to the total audit sample.

These findings demonstrate that those not seen by the respiratory team were disadvantaged in terms of receiving a PAAP, inhaler technique check, medication assessment prior to discharge, GP practices being informed within 24 hours and having hospital follow-up arranged. Both groups experienced low levels of GP follow up within 2 days after discharge. While this information is of limited value because of the small numbers involved, more work is required to ensure that patients who are not reviewed by the respiratory team receive the same standard of care as those admitted under the care of or reviewed by respiratory team members. This could be aided by wider circulation of a standardised asthma care bundle outside the respiratory team with training to draw attention to why these aspects of asthma management are so important. Another solution would be to expand capacity of respiratory teams to care for all patients hospitalised with acute severe asthma.

7.1.4 Discharge from hospital

An existing asthma care discharge bundle introduced in was only used in six percent (10 of 168) of patients. We have identified the implementation of a standardised asthma care bundle to be a key recommendation from this audit.

The audit identified that for seven percent (11 of 169) of patients, poor concordance with prescribed ICS was an issue. It is estimated that between one third and a half of medications prescribed for long-term conditions are not taken as recommended.³ This is

especially true for asthma, for which evidence suggests high levels of non-adherence to preventer medication that increase over time.³ Concordance is also self-reported, meaning that our figures are likely to be an underestimate. It is important that there is shared decision making between the patient and the healthcare professional regarding concordance to medication in order to improve adherence³, and this is an element of patient care that requires more attention.

Ninety percent (153 of 170) of patients were sent home on oral steroids or had received a full 5 day course of oral steroids prior to discharge. SIGN/BTS guidance advises that in the treatment of acute asthma clinicians should continue prednisolone for at least five days or until recovery.³ A small number of patients were not discharged on oral steroids and had not received 5 days of steroids in hospital. Based on the experience of clinical colleagues on the audit project team, it was felt likely that there was a clinical reason that steroids were not recommended, such as infection, but that this should still be incorporated as a component of the asthma care bundle.

Medication assessments including adherence review prior to discharge were documented for only 48% (80 of 168) of patients, which requires review by Trusts to try and improve this. Of the 62 patients deemed to be poorly concordant, reasons for poor concordance were addressed with just under half of patients (29 of 62), with no record in the notes for many others. It is concerning that of the group of patients who received a medication assessment over three quarters (62 of 80) were found to be poorly concordant. It is widely accepted that poor adherence with asthma medication is associated with poor asthma control and outcomes. This is an area where qualitative research could provide an insight into actual or perceived barriers that patients experience to taking medication, and it should also be incorporated into an asthma care bundle to standardise discharge planning.

Improved documentation is required for inhaler technique checks prior to discharge as there was no record of this for approximately one third of patients. Forty five percent (76 of 170) of patients did have their technique checked, and results were relatively good in NHSCT, 63% (19 of 30) and SET, 60% (26 of 43). This is however an aspect of asthma management that needs to be improved because checking inhaler technique is one of several educational measures that have shown to reduce morbidity and relapse rates after an asthma attack.³ Furthermore, of the patients who had inhaler technique

checked, 29% (22 of 76) had poor technique which improved on education, confirming the importance of this component of discharge planning.

KPI 23f states that 90% of patients with acute severe asthma should be managed in a respiratory ward or a formally designated respiratory area within a ward. This standard was only met for 49% (83 of 171) having been discharged from either of these areas. There are logistical factors that make it difficult for patients to always be admitted to a respiratory ward, including acute medical take arrangements leading to patients 'outlying' on other wards and lack of designated respiratory wards or areas in some hospitals. This is a challenge that may be difficult to combat in the short term, and so it is important that outlying patients are reviewed by the respiratory team while in hospital, and if this does not occur, that the discharging team ensure that all aspects of asthma management are completed as per an asthma care discharge bundle and review by the GP and respiratory team is arranged as per BTS guidelines.

The audit revealed that for 61% (103 of 169) of patients regionally, a PAAP was either not provided or there was no record of it being provided. KPI 23i states that 80% of people admitted with acute severe asthma should receive a written discharge care plan. Guidelines advise that all inpatients should receive a written PAAP given by healthcare professionals with expertise in providing asthma education prior to discharge.³ This is an important finding which indicates that regional improvements are required to ensure that all patients have a PAAP that they can rely on to help manage their condition in the community, preventing further exacerbations and costly readmissions. Exacerbating factors and triggers were only explored in approximately half of patients with wide variation between Trusts, which again indicates the need to standardise the discharge process and patient education.

In terms of PEF measurement prior to discharge, evidence suggests that patients discharged with PEF <75% best or predicted and with diurnal variability of >25% are more likely to have early relapse and readmissions.³ There was only evidence to suggest that 46% (76 of 165) of patients had satisfied this criterion prior to discharge, or if they did not, the discharge was discussed with the respiratory physician. It is concerning that a high proportion of patients did not have this documented in the notes, and this should be made an essential element of the asthma care discharge bundle.

BTS/SIGN guidance recommends GP follow-up and hospital review for all patients admitted to hospital with acute severe asthma. However, this audit found that results in relation to this were concerning regionally. There was evidence that the GP practice had been informed within 24 hours for only 18% (31 of 169) of inpatients. Only seven percent (11 of 166) of inpatients had a GP practice review arranged within 2 working days, although 20% (34 of 166) were advised to attend their GP practice. Hospital follow-up was only arranged for 67% of inpatients (114 of 171) and of these patients only 32% (36 of 113) had an appointment within the recommended time-frame of 4 weeks from discharge. This may be because of staff workload, understaffing or lack of awareness, but this is an important safety net that needs to be strengthened. There was also a consensus amongst clinicians on the audit project team, that any patients who were not reviewed by a member of the respiratory team during admission should be seen no later than 2 weeks from discharge.

7.2 ED Audit

7.2.1 Assessment on presentation

SpO₂ was measured in 99% (254 of 257) of patients, so it is reassuring that blood oxygen levels were available for almost all patients to determine the need for oxygen administration.

7.2.2 Management in ED

A striking result from this portion of the audit was the low percentage of patients who had received oxygen during their ED attendance. Oxygen was only administered to 5% (14 of 269) of patients who attended ED. When we examined the percentage of patients with a SpO₂ of less than 94% however, only 8% (21 of 254) of patients had oxygen saturations below this level. Therefore, it may be that a lot of attendances to ED were for patients with mild symptoms and normal SpO₂ who did not require oxygen, in which case work should be considered to signpost patients to other sources of support in the community if they have concerns about their asthma. Nevertheless, of the 21 patients who had SpO₂ of less than 94%, only 24% received oxygen (5 of 21). This is a useful finding for Trusts to explore to determine the reasons why these patients did not receive oxygen and explore options to ensure that patients receive oxygen when needed as per the national guidance.

An ABG was only performed in 36% (4 of 11) of patients presenting to ED with SpO₂ of <92%. It could be that the ABG was not completed until admission to the ward due to pressures in the ED, or that it was not completed at all due to difficulty in performing the investigation and omission, or that the patient was clinically well and it was not deemed necessary. It is important that hypercapnia is detected early due to the association with life threatening asthma and so this is a finding that Trusts should be aware of and try to address. It should form part of the ED asthma care bundle to ensure that it is considered as part of the asthma assessment.

Forty five percent (110 of 244) of patients had PEF recorded on first presentation, and 36% (39 of 108) of these patients had post-bronchodilator PEF carried out. KPI 23a states that 80% of patients in ED should have a post-bronchodilation PEF carried out and so this target was not reached. Similar to the inpatient setting, feedback from clinicians again highlighted lack of awareness, inaccessible/ lack of equipment and uncertainty of whose responsibility it is to carry out the investigation. PEF is a central investigation to the management of acute asthma in the emergency department and these results need to be improved regionally.

7.2.3 Discharge from ED

In terms of community and hospital follow-up post-discharge, results were concerning. There was evidence that the patient's GP practice had been informed within 24 hours for 17% (40 of 235) of ED attendances. Only 29% (73 of 251) of patients had follow up arranged on discharge from ED, although for the majority of patients this was arranged within 14 days. KPI 23d was used as a standard for this, but it should be noted that although it states that a patient with acute severe asthma who presents in ED should have follow up arranged within 14 days of the episode with primary or secondary care, BTS/SIGN guidance advises that GP follow up should be arranged within two working days post-discharge from ED, with a discharge letter faxed/emailed to the GP and referral made to the asthma liaison nurse/chest clinic.

7.3 Areas of good practice:

7.3.1 Inpatient audit

- Three quarters of patients were on inhaled corticosteroids prior to admission.
- A high number of patients received corticosteroids during admission, with just less than three quarters of these patients commenced on corticosteroids prior to, or within one hour of admission.
- Ninety percent of patients received five days of oral steroids during admission or were sent home on oral steroids.
- Almost all patients had oxygen saturations measured.

7.3.2 ED Audit

- Almost all patients had oxygen saturations measured.

7.4 Areas for improvement:

7.4.1 Inpatient audit

- Considerable barriers still exist to PEF measurement resulting in low numbers of patients having this important investigation carried out.
- ABG measurement needs to be incorporated into the asthma care bundle to ensure it is carried out as per BLF guidance.
- Some patients were not reviewed by the respiratory team during admission and were more likely to miss out on crucial components of asthma care.
- Not all patients are discharged from respiratory wards or designated respiratory areas within a ward.
- Low use of asthma care bundles during assessment, admission and on discharge.
- Low number of patients receiving PAAP.
- Inhaler technique was not assessed routinely.
- Substantial issues exist with the organisation of follow up post discharge with the GP practice and respiratory team.

7.4.2 ED audit

- Patients in ED settings with oxygen saturations of <92% are not always having an ABG performed.
- Not all patients with SpO₂ of <94% received oxygen.
- Barriers exist to PEF measurement leading to low number of patients having this investigation carried out.
- Substantial issues exist with follow up arrangements, with only small numbers of patients having evidence of follow up with their GP and the respiratory team arranged.

8. Recommendations

1. A standardised asthma care bundle for ED and for inpatients should be implemented which includes the pertinent aspects of acute asthma management on presentation, during admission and on discharge as per BLF/SIGN guidance;
2. Barriers to PEF measurement should be addressed by Trusts to improve the percentage of patients having this important investigation performed. Measures that could be taken to address this include the incorporation of this investigation into a standardised asthma care bundle, holding training sessions with staff on the importance of the investigation, agreeing who the responsibility for carrying out the investigation should lie with and ensuring PEF meters and charts are readily available and accessible;
3. Every opportunity should be taken to counsel asthma patients who smoke on the importance of smoking cessation;
4. All patients with an acute exacerbation of asthma should receive a review with the respiratory team prior to discharge. If they do not, it is important that the discharging team use the asthma discharge bundle to ensure all elements of discharge planning are considered including appropriate follow up. Training of other medical specialities who may care for these patients should be considered to highlight this once the asthma care bundle is agreed;
5. It should be highlighted that patients with acute severe asthma should be managed in a respiratory ward or a designated area within a respiratory ward;
6. Discharge planning is crucial to prevent further exacerbations of asthma and readmissions. Trusts should provide learning events and training to staff that is focused on the key features of discharge planning as per BTS/SIGN guidance, or ensure that all asthma patients are cared for by respiratory teams;
7. The importance of timely notification of the GP practice and arrangement of follow-up with the GP practice and respiratory team should be highlighted. Patients who are not seen by any member of the respiratory team during their

admission should be seen within 2 weeks of discharge as per respiratory clinical consensus rather than the standard 4 weeks;

8. Trusts should consider how to improve the documentation in medical notes of all management delivered to the patient as frequently major aspects of asthma care were not recorded;
9. Trusts should investigate if a large volume of patients attend ED with milder symptoms that could be treated in the community and consider how to bolster the community support available for patients.

KEY (Change status)

- 1 Recommendation agreed but not yet actioned
- 2 Action in progress
- 3 Recommendation fully implemented
- 4 Recommendation never actioned (please state reasons)
- 5 Other (please provide supporting information)

Project Number:

9. Clinical Audit Action Plan

Project title	An audit of adult asthma care within Inpatient and Emergency Department settings
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Action plan lead	Name: Dr Christine McMaster	Title: Public health consultant	Contact:
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Ensure that the recommendations detailed in the action plan mirror those recorded in the “Recommendations” section of the report. The “Actions required” should specifically state what needs to be done to achieve the recommendation. All updates to the action plan should be included in the “Comments” section.

Recommendation	Actions Required (specify “None”, if none required)	Action by Date	Person Responsible (Name and grade)	Comments/Action Status (Provide examples of action in progress, changes in practices, problems encountered in facilitating change, reasons why recommendation has not been actioned etc)	Change Stage (see Key)
Inpatient Audit					
A standardised asthma care bundle should be developed for ED and inpatients which includes the pertinent aspects of acute asthma management on presentation, during admission and on discharge as per BLF/SIGN guidance.	Care bundle to be developed				
This asthma care bundle should then be implemented for ED and inpatients.	HSC Trusts to develop plan to action recommendation				

Barriers to PEF measurement should be addressed by Trusts to improve the percentage of patients having this important investigation performed. Measures that could be taken to address this include the incorporation of this investigation into a standardised asthma care bundle, holding training sessions with staff on the importance of the investigation, agreeing who the responsibility for carrying out the investigation should lie with and ensuring PEF meters and charts are readily available and accessible.	HSC Trusts to develop plan to action recommendation				
Every opportunity should be taken to counsel asthma patients who smoke on smoking cessation	HSC Trusts to develop plan to action recommendation				
All patients with an acute exacerbation of asthma should receive a review with the respiratory team prior to discharge. If they do not, it is important that the discharging team use the asthma discharge bundle to ensure all elements of discharge planning are considered including appropriate follow up. Training of other medical specialities who may care for these patients should be considered to highlight this once the asthma care bundle is agreed	HSC Trusts to develop plan to action recommendation				
It should be highlighted that patients with acute severe asthma should be managed in a respiratory ward or a designated area within a respiratory ward	HSC Trusts to develop plan to action recommendation				
Discharge planning is crucial to prevent further exacerbations of asthma and readmissions. Trusts should provide learning events and training to staff that is focused on the key features of discharge planning as per BTS/SIGN guidance	HSC Trusts to develop plan to action recommendation				

The importance of timely notification of the GP practice and arrangement of follow-up with the GP practice and respiratory team should be highlighted. Patients who are not seen by any member of the respiratory team during their admission should be seen within 2 weeks of discharge as per clinical consensus rather than the standard 4 weeks	HSC Trusts to develop plan to action recommendation				
Trusts should consider how to improve the documentation in medical notes of all management delivered to the patient as frequently major aspects of asthma care were not recorded	HSC Trusts to develop plan to action recommendation				
Trusts should investigate if a large volume of patients attend ED with milder symptoms that could be treated in the community and consider how to bolster the community support available for patients	HSC Trusts to develop plan to action recommendation				
Overall					
The results of this audit should be widely distributed to all HSCTs and HSC Professionals through the Respiratory Forum	Respiratory Forum to distribute audit report				
All HSCTs should develop an action plan to address challenges identified in this audit.	Trusts to return completed action plans to the audit group				

10. Project Team

Name	Job Title/Specialty	Trust/ Organisation	Role within Audit (Audit lead, data collector, data analyse, data cleansing, report writing, internal reviewer, etc)
Dr Christine McMaster	Public health consultant	PHA	Project lead (overall responsibility for leading project, co-ordinating the writing of the final report & dissemination of results)
Dr Jenny Mack	Public health registrar	PHA	Joint deputy project lead
Wendy Thornton	Project manager	PHA	Joint deputy project lead (Will support the project lead and act as contact point for the Trust audit co-ordinators, planning and support of data collector training and all Project and steering team meetings)
Anne-Marie Marley	Respiratory nurse consultant	BHSCT	Trust audit co-ordinator (Trust audit co-ordinators will be responsible for the co-ordination of the audit within their own Trust, providing input into the design of the audit, and act as a point of contact for Trust data collector – internal review also)
Caroline Speedy	Respiratory service improvement manager	NHSCT	Trust audit co-ordinator
Jennifer Howard	Respiratory Lead	SET	Trust audit co-ordinator
Kay Carroll	Head of service respiratory	SHSCT	Trust audit co-ordinator
Siobhan Donnelly	Community Respiratory team leader	WHSCT	Trust audit co-ordinator
Dr Claire Butler	Adult respiratory consultant	BHSCT	Trust lead consultant
Dr Dairmuid McNicholl	Adult respiratory consultant	NHSCT	Trust lead consultant
Dr Richard Hewitt	Adult respiratory consultant	SET	Trust lead consultant
Dr Shane Moan	Adult respiratory consultant	SHSCT	Trust lead consultant
Dr Martin Kelly	Adult respiratory consultant	WHSCT	Trust lead consultant
Rose McHugh	Nurse consultant	PHA	Regional nursing lead (will support the design of the audit and internal review)
Robert Mercer	Clinical audit facilitator	RQIA	RQIA representative
Marty Doyle	Information manager	HSCB	Regional co-ordinator for data cleansing & analysis



The **Regulation** and
Quality Improvement
Authority

The Regulation and Quality Improvement Authority

9th Floor

Riverside Tower

5 Lanyon Place

BELFAST

BT1 3BT

Tel 028 9536 1111

Email info@rqia.org.uk

Web www.rqia.org.uk

 [@RQIANews](https://twitter.com/RQIANews)