National Respiratory Audit Programme (NRAP)

Catching our breath report – methodology

Version 1 – May 2025

Methodology of the audit creation and set up

NRAP is a suite of continuous clinical audits, the oldest of which commenced in February 2017. There are four audits covering the following workstreams – COPD, adult asthma, children and young people's asthma and pulmonary rehabilitation.

This report presents data describing the care during 129,044 hospital admissions and those assessed for pulmonary rehabilitation. 189 hospitals and 183 pulmonary rehabilitation services submitted records to the audit across England and Wales.

- 98,601 admissions for people with asthma and COPD discharged from hospital between April 2023 and March 2024
- 27,507 people with COPD assessed for pulmonary rehabilitation between April 2023 and March 2024

Information governance and data storage, security and transfer

The COPD, adult asthma, and pulmonary rehabilitation audits operate under Section 251 approval from the Confidentiality Advisory Group (CAG) of the Health Research Authority (HRA) (COPD/adult asthma reference number: **23/CAG/0045,** pulmonary rehabilitation reference number**: 23/CAG/0167**) A record of the approval can be found here. (April 2013 onwards; non-research).

The children and young people's asthma audit operates under Section 251 approval in England and Wales from the Confidentiality Advisory Group (CAG) of the Health Research Authority (HRA) (reference number: **19/CAG/0001**) A record of this approval can be found here.

To find out more about the audit's information governance (IG), legal basis, data storage, security and transfer arrangements please review the COPD fair processing document, IG frequently asked questions (FAQs) and the audit's data flow diagram, all of which can be found on the NRAP webpages under the respective workstreams.

Audit questions and data entry

The data sets for the individual work streams can be accessed using the links below.

- COPD
- Adult asthma
- Children and young people asthma
- Pulmonary rehabilitation

Services are required to enter data via the audit programme's bespoke web tool, created by Crown Informatics Ltd available at www.nrap.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 the web tool www.nrap.org.uk.

Data entry to the audit is regularly reviewed by the NRAP team. Where few records are entered or where there is a notable change in participation rates, the NRAP team communicate directly with the service to understand the reasons behind the lack of participation and to provide support where possible. Regular email updates and newsletters are also sent to participants with timeline reminders.

Analysis methodology

Deadline and data transfer

The data entry deadline for completion of records pertaining to the audit period was May 2024 for adult asthma, children and young people asthma, COPD and August 2024 for PR. Thereafter, data were extracted by Crown Informatics, drafts were excluded, and the data was anonymised as follows:

- NHS number replaced by an anonymised patient identifier.
- Postcode replaced by a Lower Layer Super Output Area (LSOA) (a geographical area in England and Wales which is large enough to be nonidentifiable to the patient)
- 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 statistical 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. Data received from the RCP were imported into R version 4.4.1. Each patient was linked to the combined England and Wales Index of Multiple Deprivation (IMD) using the patients' LSOA11 code. This combined measure is provided by the Office of National Statistics and allows direct comparisons between Welsh and English deprivation indices (https://www.gov.uk/government/statistics/indices-of-deprivation-2019-income-and-employment-domains-combined-for-england-and-wales) by restricting the indices to deprivation domains that are shared across the two countries. Patients without an LSOA11 code could not be linked to an IMD quintile.

Asthma severity was classified into 'moderate', 'severe', 'life-threatening', or 'near fatal' according to the NICE guideline thresholds using collected physiological and symptom variables (https://bnf.nice.org.uk/treatment-summaries/asthma-acute). Patients recorded as 'patient too unwell' for peak flow measurement whose other measurements indicated moderate asthma severity were reclassified as severe.

Differences in test values (ISWT, 6MWT, ESWT, CAT, CRQ domains, EQ5D domains and visual analogue score (VAS)) were calculated by subtracting the initial test result from the discharge test result. MCID variables for ISWT, 6MWT, CAT, and CRQ domains were then created by categorising the test value difference variables into those who achieved the MCID and those who didn't, with MCID achieved defined as: >=35 for ISWT, >=30 for 6MWT, <= -2 for CAT, >=0.5 for CRQ domains, and >=6.9 for the EQ5D-VAS. To calculate the MCID for the EQ5D, domains were weighted and combined using the weights for England and methodology provided by Devlin (2017) (ref: https://onlinelibrary.wiley.com/doi/full/10.1002/hec.3564) to provide an overall EQ5D utility index. To calculate the MCID, the score at discharge was subtracted from the score at assessment, with achievement of MCID being defined as an improvement of >= 0.051.

Data was cleaned by restricting to the appropriate time period, excluding draft records, test records, duplicate records, and patients marked as overseas, and by removing patients with logical inconsistencies in their data (for example, being discharged before being admitted, receiving non-invasive ventilation after discharge, or being marked as not receiving a peak flow measurement but also being given a time for peak flow measurement). Patients with an erroneous date inputted for acute hypercapnic ventilatory failure that was inputted over 24

hours before arrival (due to the wrong month or year being selected) was replaced with the patient's arrival date. Overall, 65,406/65,410 COPD records, 18,884/18,900 adult asthma records, 14,311/14,311 CYP asthma records, and 30,443/30,450 pulmonary rehabilitation records were suitable for analysis. All scripts used for cleaning and analysis can be found at https://github.com/NationalAsthmaCOPDAudit/2023-24_Clinical_audit_COPD_AA_CYPA_PR.

Case ascertainment

Case ascertainment calculations are based on the number of records entered into the secondary care audits (COPD, adult asthma, CYP asthma) compared to national hospital asthma and COPD exacerbation data obtained from Hospital Episode Statistics (HES) Admitted Patient Care (APC) (England) and Digital Health Care Wales (DHCW) Patient Episode Database (PEDW) (Wales) datasets. Data is requested at the hospital level for the entire audit period. HES patient record numbers are rounded to the nearest 5 records unless they are between 1 and 7 in total, in which case they are replaced with an asterisk.

Hospitals who submitted at least 1 record during the audit period are included in the calculations. Hospitals who have submitted 0 records are excluded and are presented as non-participants for the report (Registered – No data submitted; Not registered). Case ascertainment for each hospital is calculated by dividing the number of (cleaned) submitted audit records in the audit period by the number of records present in HES over the same time period to give a proportion. For CYP asthma it is not possible to determine in HES data whether a patient was seen in a paediatric ward or adult ward, and therefore case ascertainment is only calculated for patients up to the age of 16.

Case ascertainment – pulmonary rehabilitation

For pulmonary rehabilitation (PR), data for this report was collected via an online survey made available to PR services in autumn 2024 and covers people with COPD referred to, assessed for and discharged from a PR programme in England and Wales between 1 April 2023 and 31 March 2024.

Case ascertainment rates have been calculated based on the total number of COPD records submitted to NRAP during this cohort period, compared with the data obtained from PR services on the number of people with COPD who were eligible for inclusion in the NRAP PR clinical audit.

Expansion of the PR audit to collect data on other respiratory conditions in addition to COPD took place in November 2023, which was halfway through the reporting period for this cohort. Therefore, case ascertainment has only been calculated for COPD patients to provide a complete picture for this reporting period.

All patients deemed eligible to be included in the audit were approached by a PR service team member to give written/verbal consent for their data to be used in the NRAP audit.

Please note, where case ascertainment is over 100% this is likely to be due PR services not routinely collecting or storing this information and therefore not being able to report it accurately on request. NRAP recommends PR services establish processes for accurately recording this information as it will be collected and reported on an annual basis from now on.