National Respiratory Audit Programme (NRAP)

Breathing well report – methodology

Version 1.0 – July 2024

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 117, 340 hospital admissions and those assessed for pulmonary rehabilitation. 676 services submitted records to the audit across England and Wales.

- 94,316 admissions for people with asthma and COPD discharged from hospital between April 2022 and March 2023
- 23,024 people with COPD assessed for pulmonary rehabilitation between March 2022 and February 2023

Information governance and data storage, security and transfer

The COPD and adult asthma audits operate under Section 251 approval from the Confidentiality Advisory Group (CAG) of the Health Research Authority (HRA) (reference number: **23/CAG/0045**) 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.

Recruitment of services

For further details of the recruitment methodology employed, please refer to the data analysis and methodology component of the following reports.

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

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 2023 for adult asthma, children and young people asthma, COPD and August 2023 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 clearing and analysis

The data were analysed at Imperial College London. Data received from the RCP were imported into R version 4.2.0. 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' or 'severe and life-threatening' according to the NICE guideline thresholds for heart rate, respiratory rate, oxygen saturation (where measured) and peak flow (where measured). In addition, patients with a heart rate <30 bpm or a respiratory rate <10 breathes per minute were classified as 'severe and life-threatening'. The 'severe' and 'life-threatening' NICE categories were grouped together because data collected within the audit is not sufficient to distinguish between these two categories. Patients recorded as 'Patient too unwell' for peak flow measurement whose other physiological measurements were normal were classified as 'severe and life threatening'. NICE guidelines do not provide any

recommendations on grading asthma severity in children <2 so these children did not have an associated asthma severity.

Differences in test values (ISWT, 6MWT, ESWT, CAT, CRQ domains) 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.

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). Overall, 66,406/66,544 COPD records, 16,701/16,872 adult asthma records, 11,209/11,265 CYP asthma records, and 23,024/23,034 pulmonary rehabilitation records were suitable for analysis.

Adjusted odds ratios with confidence intervals were calculated using the 'glmer' command from the R package 'lme4' with a clustering variable (hospital) and explanatory variable(s) connected to the outcome through a binomial logit link.

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.