

Candidate Features

14 October 2020 11:39

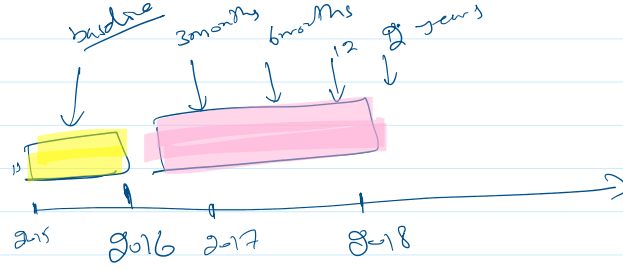
Open access	
Table 1 Candidate predictors to be assessed for inclusion in models (adapted from Blakey <i>et al.</i>)	
Variable	Description
Sex	Male or female
Age	In years at the start of the 3-year study period
BMI	Last recorded, in kg/m ² ; categorised as underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) or obese (≥30)
Ethnicity	Ethnicity information if available (white, black, Asian, South Asian Caribbean etc)
Smoking status	Last recorded, categorised as never smoker, current smoker or ex-smoker
Charlson comorbidity index	Score in the baseline year, categorised as 0, 1–4, 5–9, ≥10
Comorbidities	Recorded ever or active: eczema, allergic and non-allergic rhinitis, nasal polyps, anaphylaxis diagnosis, anxiety/depression diagnosis, diabetes (type 1 or 2), GERD, cardiovascular disease, ischaemic heart disease, heart failure, psoriasis
Comedications	In baseline year, prescription (yes/no) for paracetamol, NSAIDs, beta-blockers, statins
% predicted PEF	Recorded ever, expressed as percentage of predicted normal, categorised as unknown, <60%, 61%–79% and ≥80%
Blood eosinophil count	Last recorded, in 10 ⁹ cells/L, categorised as ≤0.4 or >0.4
BTS step	
Step 1	Inhaled SABA as needed
Step 2	ICS or LTRA
Step 3	Add LABA to ICS or use high-dose ICS (≥400 mg/day FP equivalent)
Step 4	Add LTRA/Theo to (ICS+LABA) or add LABA/LTRA/Theo to high-dose ICS
Step 5	Add OCS
Average daily dose of SABA/ICS	Cumulative dose of SABA/ICS prescribed in baseline year, expressed in mg/day albuterol or FP equivalent and divided by 365.25
Prescribed daily ICS dose	Dose of ICS prescribed at last prescription of baseline year in mg/day, FP equivalents
ICS medication possession ratio	ICS refill rate during the baseline year: sum of number of days per pack (number of actuations per pack/number of actuations per day)/365.25
ICS device type	In baseline year: categorised as no ICS, MDI, BAI or DPI
Spacer use with ICS pMDI	Recorded in baseline year (yes/no)
Oral corticosteroid use	Any maintenance prescription for corticosteroids in baseline year (yes/no)
Prior asthma education	Recorded ever (yes/no)
Primary care consults	Number of primary care consultations, categorised as 0, 1–5, 6–12, ≥13
Primary care consults for asthma	Number of primary care consultations with an asthma-related Read code
Antibiotics with lower respiratory consult	Number of consultations that resulted in antibiotic prescription (included to capture asthma events that may have been misclassified as LRTI)
Acute respiratory events	Number of events in the baseline year, defined as asthma-related hospitalisation or ED attendance or an acute course of OCS or antibiotics prescription with lower respiratory consultation
Acute OCS courses	Number of acute courses of OCS in baseline year, categorised as 0, 1, ≥2
Acute OCS courses with lower respiratory consult	Number of OCS courses with Read code for lower respiratory consultation in baseline year, categorised as 0, 1, ≥2
Antibiotics courses	Number of antibiotics prescriptions with Read code for lower respiratory consultation in baseline year, categorised as 0, 1, ≥2
Hospital attendance/admission	Number of asthma-related ED, inpatient and outpatient attendance/admission in baseline year (as recorded in primary care data)
Asthma attacks	Number of asthma-related hospital ED attendance, inpatient admission or acute OCS course
Eosinophil count	Blood eosinophil count (cells/L) categorised into high and not high (threshold of 0.35 × 10 ⁹ cells/L) to define high/not high eosinophil count*

BNF

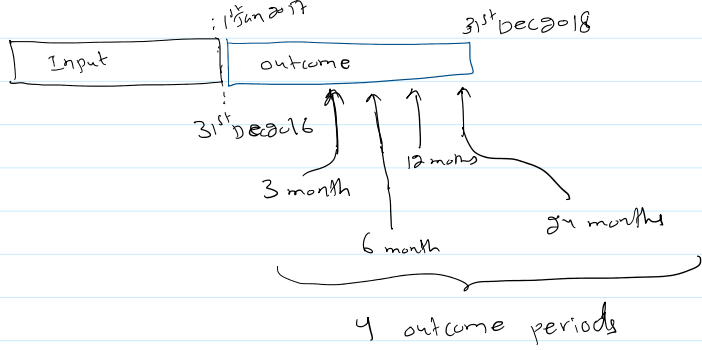
{ SABA will be coded later

if OCS not present, then it's 0

[= =]



Risk factors: from latest data until 31st Dec 2016



4 outcome periods

- subsequent treatment influence is ignored which may have prevented attack (problem with later months outcomes)
- impossible and probably unethical to do nothing for 2 years and then predict

3rd Dec 2020

- Prepare the input data (take value from baseline year)

- For each feature, table:
patient ID, feature value

↓
1st Jun 2016 - 31st Jun 2016

Features

Sex: & Age:

Patid, Sex, Age, Practice_id,

Age in 2016 = 2016 - year of birth

BMI

get most recent weight measurement (before 31st Dec 2016) and height measurement; for each patient (BMI rescaling needed in some cases as it is sometimes entered in metres and sometimes in cm).

Charlson CMI:-

IR = all read-codes

IS = unique (CDE)

score (IS)

PEF coding: use the EN13826 scale and find appropriate categories

27th Jan 2021

ICS medication possession ratio:

$$\left(\frac{\text{num of actuations per pack}}{\text{num of actuations per day}} \right) \left(365.25 \right)$$

2nd Feb 2021

Encoding features, 21, 22, 24-27

① - LRTI

A + ~~A~~: 21

② - OCS

A + B: 24

③ - Antibio

A + C: 25

④ - Insp

D: 26

"A + B", D: 27

A + C, A + B, D: 22

- LRTI

Primary care consults for asthma	Number of primary care consultations with an asthma-related Read code	
Antibiotics with lower respiratory consult	Number of consultations that resulted in antibiotic prescription (included to capture asthma events that may have been misclassified as LRTI)	→ count antibiotics
Acute respiratory events	Number of events in the baseline year, defined as asthma-related hospitalisation or ED attendance or an acute course of OCS or antibiotics prescription with lower respiratory consultation	→ hosp*, ED, OCS + LRTI, Antibiotics + LRTI
Acute OCS courses	Number of acute courses of OCS in baseline year, categorised as 0, 1, ≥2	→ OCS + LRTI
Acute OCS courses with lower respiratory consult	Number of acute courses of OCS with Read code for lower respiratory consultation in baseline year, categorised as 0, 1, ≥2	→ Antibiotics + LRTI
Antibiotics courses	Number of antibiotics prescriptions with Read code for lower respiratory consultation in baseline year, categorised as 0, 1, ≥2	→ hosp*
Hospital attendance/admission	Number of asthma-related ED, inpatient and outpatient attendance/admission in baseline year (as recorded in primary care data)	→ (OCS + LRTI) OR (ED, hosp)
Asthma attacks	Number of asthma-related hospital ED attendance, inpatient admission or acute OCS course	

- Hosp. Keep
- Antibiotics - keep
- OCS - keep


Feature 22:

filter (OCS == 1, Hosp == 1, Antibiotics == 1)
8
count

43087248:

43092851: 6 vs 1

Background:

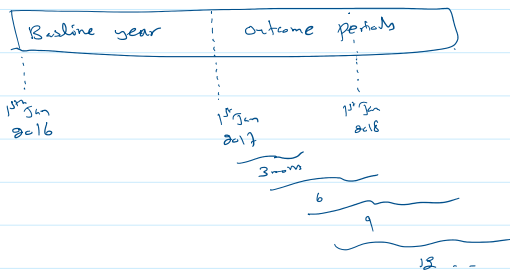
- Asthma affects  across UK/worldwide
- Heterogeneous
- Some patients need more frequent review than others
- Can we use data-driven methods to help improve

Objective:

Develop data-driven risk stratification ^{tool} (model) as the basis of a tool

Methods:

- OPCS database, large & growing database (10 million+ and counting)
- Identified all asthma patients (more reliably tracked)



Modeling work:

Can we predict if a patient will have an attack in:

- (A) 3 months
- (B) 6 months
- ...

or

- i) 2 or more attacks
- ii) 4 or more attacks