CRP in COPD Management

Simon Barry

WEQAS Cardiff December 2023

Scand J Prim Health Care 1988; 6: 111–17

The Diagnosis of Adult Pneumonia in General Practice

The Diagnostic Value of History, Physical Examination and Some Blood Tests

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Melbye H, Straume B, Aasebø U, Brox J. The diagnosis of adult pneumonia in general practice. Scand J Prim Health Care 1988; 6: 111–17.

Because of lower respiratory infection that was treated with antibiotics on the suspicion of pneumonia, 71 patients aged 15 years or more were referred to the study by general practitioners. Using a positive chest X-ray as a "gold standard", 15 % had pneumonia. The diagnostic value of variables from history, physical examination and blood tests was evaluated by calculating the likelihood ratio (LR). A duration of illness less than 24 hours before consulting the general practitioner was the variable from the history with the highest LR, 13.5. The white blood cell count and particularly the C-reactive protein analysis had a high diagnostic value, CRP >50 mg/l had an LR of 37. In this selected material pulmonary symptoms and lung findings were of minor value in differentiating patients with and without pneumonia, with no LR exceeding 2.3. This can be explained to some extent by selection bias.

Key words: pneumonia, crackles, CRP-analysis, diagnostic value, likelihood ratio.

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Table IV. *Diagnostic value of physical findings in 71 patients treated with antibiotics for suspected pneumonia in general practice*

Findings	Sensitivity	Specificity	Likelihood ratio	Positive predictive value
Sick appearance	0.64	0.42	1.1	0.17
Cough attack when inspiring deeply[a]	0.52	0.36	0.8	0.14
Respiratory rate >24/min[a]	0.66	0.6	1.8	0.25
Crackles	0.64	0.48	1.2	0.18
One lung	0.36	0.6	0.9	0.14
Both lungs	0.27	0.88	2.3	0.30
Wheezes	0.36	0.5	0.7	0.12
One lung	0.18	0.83	1.0	0.15
Both lungs	0.18	0.67	0.6	0.09
Both lungs without crackles	0.0	0.83	0.0	0.0
Decreased breath sounds	0.27	0.73	1.0	0.15
Dullness to percussion	0.18	0.82	1.0	0.15
Pleural rubs	0.09	0.82	0.5	0.08

[a] These findings reported on only 64 and 65 patients respectively.

Table V. *Diagnostic value of blood tests in 69 patients treated with antibiotics for suspected pneumonia in general practice*

	Sensitivity	Specificity	Likelihood ratio	Positive predictive value
ESR >20 mm/h	0.91	0.43	1.6	0.23
ESR >50 mm/h	0.36	0.88	3.0	0.36
WBC $>9.5\times10^9$	0.45	0.91	5.0	0.50
WBC $>11.5\times10^9$	0.18	0.97	5.2	0.50
WBC $<6.5\times10^9$	0.09	0.52	0.2	0.03
Blood smear diff. counts[a]				
Lymphocytes >50 %	0.0	0.65	0.0	0.0
Neutrophils 65 %	0.30	0.69	1.0	0.15
Stabs >10 %	0.60	0.81	3.2	0.40
C-reactive protein				
CRP >11 mg/l	0.82	0.60	2.1	0.28
CRP >50 mg/l	0.74	0.96	37.0	0.80

[a] Blood smear was only examined in 58 patients of whom ten had pneumonia.

Article

The Role of CRP POC Testing in the Fight against Antibiotic Overuse in European Primary Care: Recommendations from a European Expert Panel

Ivan Gentile [1,†], Nicola Schiano Moriello [2,*,†], Rogier Hopstaken [3,†], Carl Llor [4,†], Hasse Melbye [5,†] and Oliver Senn [6,†]

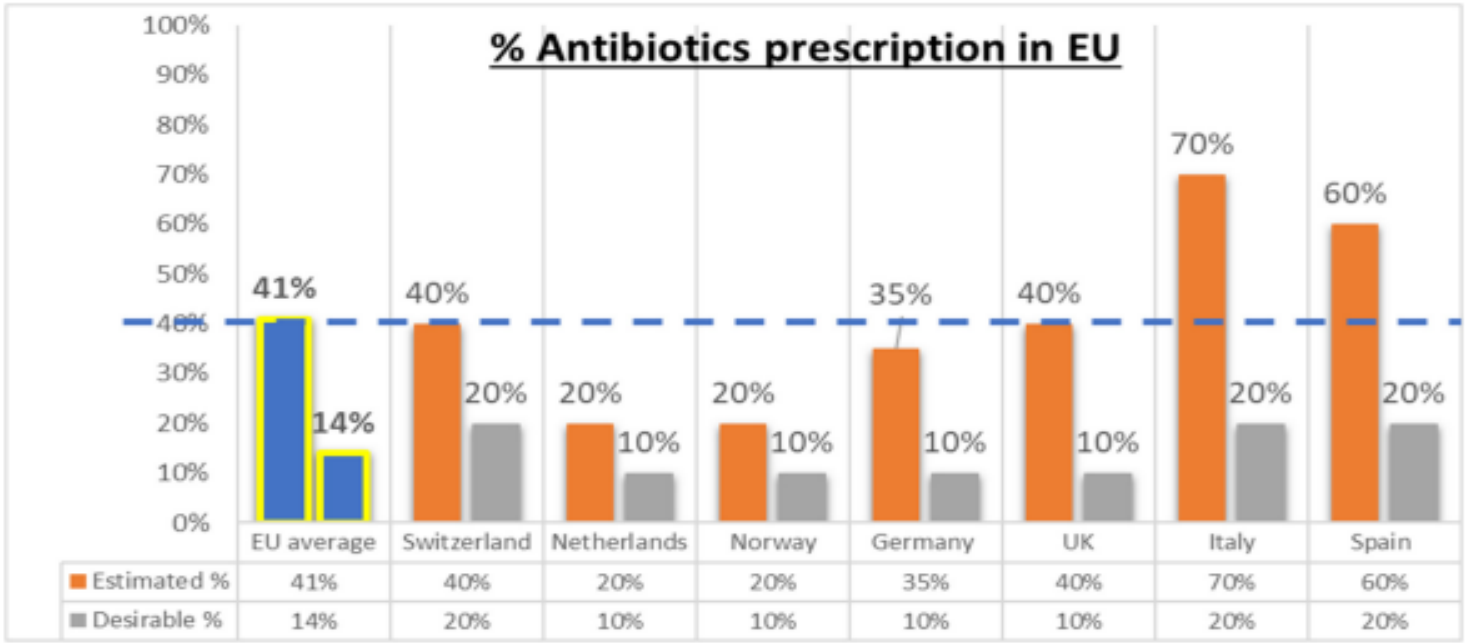

Figure 2. Perceptions of antibiotic prescribing rates for LRTIs in Europe by country. Q: In your country, do you know the approximate percent of antibiotic prescriptions for Lower respiratory tract infections in primary care and what percent would be desirable from your point of view? The dotted blue line represents UE average.

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C-Reactive Protein Testing to Guide Antibiotic Prescribing for COPD Exacerbations

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Hasse Melbye, Ph.D., Carl Llor, Ph.D., Jochen W.L. Cals, M.D., Ph.D., Gurudutt Naik, M.B., M.S., M.P.H., Nigel Kirby, M.A., Micaela Gal, D.Phil., Evgenia Riga, M.Sc., and Nick A. Francis, Ph.D.

- N= 653 with COPD
- 86 GP practices in England and Wales
- Randomised to usual care or CRP guided care
- Outcomes patient reported antibiotic usage and COPD health status

PACE Results

- Of 317 randomised to CRP arm, median value was 6 mg/l
- 76% had CRP values < 20
- 12% had CRP values 20-40
- 12% had CRP values >40
- Overall in CRP arm antibiotics prescribed in 47.7% vs 69.7% in usual care group (22% reduction, adjusted OR 0.31, 95% CI 0.21 to o.45)
- Slight reduction in COPD questionnaire score in CRP group (less severe)

PACE conclusions

- CRP testing can reduce antibiotic prescribing with no evidence of harm

- But, could have been a 76% -88% reduction in antibiotics if algorthim had been followed strictly

Expert Group Consensus Statements – Overview

CONSENSUS STATEMENT 1:

Antimicrobial resistance is a global threat that must urgently be addressed.

CONSENSUS STATEMENT 2:

Antibiotic overprescribing for respiratory tract infections in primary care is a significant contributor to rising antimicrobial resistance.

CONSENSUS STATEMENT 3:

C-reactive protein point of care testing (CRP POCT) is an established tool that is proven to effectively and safely reduce overprescribing of antibiotics for lower respiratory tract infections (LRTIs) in adults presenting at primary care.

CONSENSUS STATEMENT 4:

To safely reduce antibiotic prescribing in primary care for patients presenting with respiratory illness, a broader application of CRP POCT globally is recommended.

CONSENSUS STATEMENT 5:

An effective implementation, combining CRP POCT together with evidence-based complementary strategies, can increase the contribution to more appropriate antibiotic prescribing.

CONSENSUS STATEMENT 6:

In the ambulatory care of febrile children presenting with symptoms of respiratory illness, CRP POCT can be useful to guide decisions regarding antibiotic prescribing and hospital referrals.

CONSENSUS STATEMENT 7:

The use of CRP POCT for the management of patients presenting symptoms of LRTIs in primary care can be economically viable in several contexts.

Guidance on C-reactive protein point-of-care testing and complementary strategies to improve antibiotic prescribing for adults with lower respiratory tract infections in primary care

Oliver Van Hecke[1,2*†], Lars Bjerrum[3†], Ivan Gentile[4†], Rogier Hopstaken[5†], Hasse Melbye[6†], Andreas Plate[7†], Jan Y. Verbakel[8,2†], Carl Llor[9‡] and Annamaria Staiano[10‡]

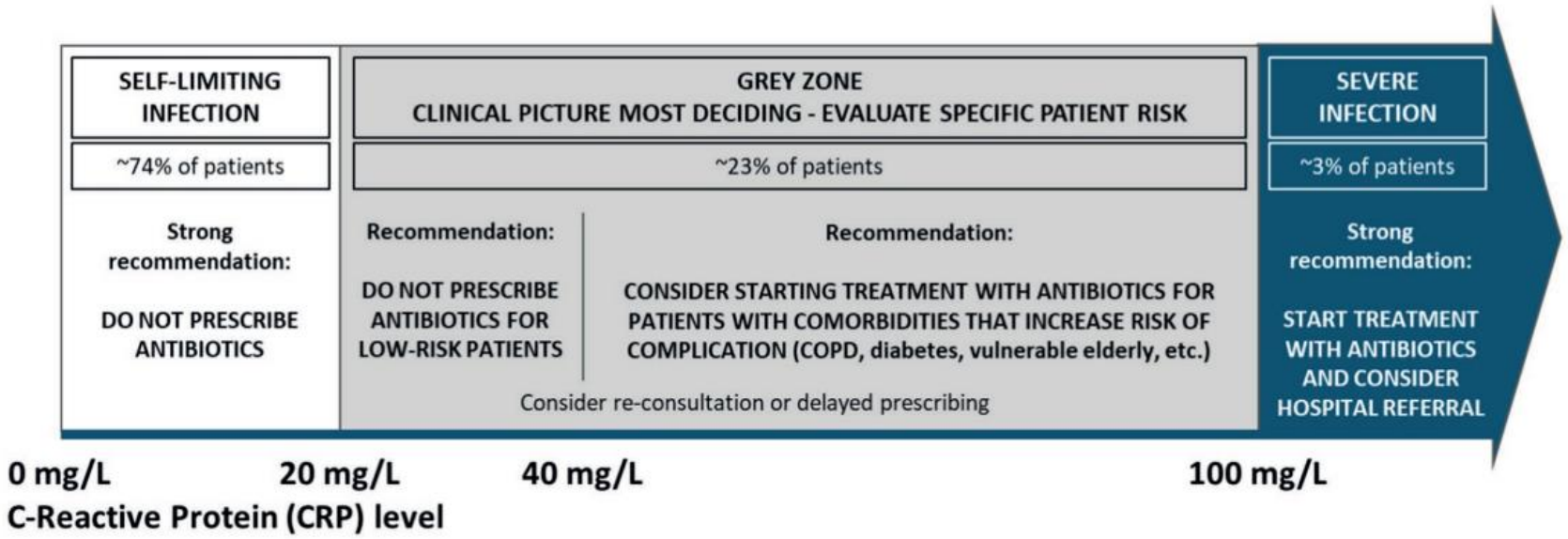

FIGURE 1
CRP thresholds for adults presenting symptoms of LRTIs.

The All Wales Primary Care Management of Acute COPD Exacerbation Guideline

For services with access to Point of Care CRP

Clinical Pathway

Also available in digital format

The All Wales Primary Care Management of Acute COPD Exacerbation Guideline

STEP 1: ASSESSMENT

Assess Symptoms

Send sputum for culture in cases of recurrent or severe exacerbation

The presence of pseudomonas or other organisms may require intravenous therapy

Consider chest radiograph in cases of severe exacerbation, or the patient is presenting with chest signs or they fail to improve

Exacerbation **WITHOUT** increased sputum purulence

Exacerbation **WITH** increased sputum purulence

STEP 2: TEST

C-Reactive Protein (CRP)

No CRP required

CRP <20

CRP 20-40

CRP >40

STEP 3: PRESCRIBE

No Antibiotics required

Increase SABA to 2 puffs QDS

Consider Prednisolone (30mg OD for 5 days)

Antibiotics unlikely to be helpful

Increase SABA to 2 puffs QDS

Consider Prednisolone (30mg OD for 5 days)

Consider antibiotics

Consider immediate antibiotics, or a delayed prescription to be started only if symptoms do not improve or deteriorate

Increase SABA to 2 puffs QDS

Consider Prednisolone (30mg OD 5 days)

Prescribe antibiotics

Doxycycline 200mg stat then 100mg BD for 5 days

alternative to doxycycline:

Amoxicillin 500mg TDS 5 days

Increase SABA to 2 puffs QDS

Consider Prednisolone 30mg OD 5 days

If symptoms are stable or improve continue to the ALL WALES COPD MANAGEMENT & PRESCRIBING GUIDELINE

If symptoms not improving or if they are worsening consider hospital admission

Further antibiotics are USUALLY not beneficial

STEP 1 INFORMATION: ASSESSMENT

Assess Symptoms

Symptoms
- Increased sputum purulence
- Increased sputum volume
- Increased breathlessness

Severity
- Impairment of ADL
- Confusion
- Severity of breathlessness
- New or worsening oedema

Measure
- Temperature
- Oxygen saturation
- Examine chest
- Blood pressure, pulse and respiratory rate

STEP 3 INFORMATION: PRESCRIBE

Antibiotic Consideration

- Follow breathlessness techniques
- For exacerbations in patients with severe COPD, particularly where anxiety is a prominent feature, consider:
  - Oramorph (5-10mg QDS PRN)
  - or
  - Lorazepam (0.5-1mg TDS PRN)
- Consider palliative care referral where appropriate

ADL: Activities of daily living
CRP: C-Reactive Protein
PRN: As needed
LABA: Short-Acting Beta-Agonist

OD: Once daily
BD: Twice a day
TDS: Three times a day
QDS: Four times a day

More information at
icst.info/the-all-wales-management-of-acute-copd-exacerbation-guideline

More information at
icst.info/national-pathway-to-prevent-unnecessary-admissions-to-hospital-for-COPD

Designed by The Institute of Clinical Science & Technology

What is happening in Wales with POC CRP?

- More Afinions POC testing devices in Wales per practice than England
- 200 Lumera DX devices, most not currently being used
- Lack of implementation of the POCT COPD CRP guideline- COVID

Background in Wales respiratory health

- National digital approach to develop guidelines for COPD and asthma
- National patient apps for COPD and asthma
- Educational modules for HCP
- = Respiratory toolkit

All Wales Adult Asthma Management and Prescribing Guideline

CORE PRINCIPLES

- **All patients with asthma should be treated with an inhaled corticosteroid (ICS) as the practice of using short acting bronchodilator (SABA) monotherapy is now outdated and no longer acceptable.**
- Review control within a maximum of 3 months of change in therapy
- Poor asthma control - Use of reliever (including PRN doses of MART regime) >2 times per week, poor symptom control, exacerbations. *More than 6 SABA prescriptions per year should prompt urgent review*
- **Review inhaler technique, concordance and co-morbidity at every opportunity including prior to stepping up therapy**
- **Consider stepping down treatment if asthma is well controlled**
- Ensure asthma action plan is updated Asthma hub

INHALER PRINCIPLES

- Choice of inhaler is based on patient's preference and **technique.**
- Whenever possible choose a device with low global warming potential.
- Only choose inhalers that you have **observed the patient using correctly.**
- If more than one inhaler is being prescribed, both the ICS and SABA inhalers should be of the same type; i.e. do not mix MDIs and DPIs whenever possible
- Where indicated below, the MDIs should be inhaled via a spacer device such as an AeroChamber flow-vu
- Always prescribe by brand to ensure consistent device
- Inhaled corticosteroids (ICS) and long-acting bronchodilators (LABA) MUST be prescribed as a combination product to obviate the risk of patients inadvertently taking the LABA as mono-therapy, which has been associated with increased risk of mortality.

INDICATIONS FOR REFERRAL

- Diagnostic uncertainty
- Complex comorbidity
- Suspected occupational asthma
- Poor control following treatment at Step 4
- ≥2 courses of oral steroids/ year despite optimising therapy in primary care

STEP 1: NEW ASTHMA DIAGNOSIS

Commence **regular low-dose** ICS plus PRN SABA.

Reinforce need to take ICS and that SABA should not be required more than twice per week

If asthma with infrequent symptoms (e.g less than twice a month) take ICS and SABA together on a PRN basis

DPI

ICS OPTIONS INCLUDE:

- Budesonide Easyhaler 100mcg 2 doses BD
- Budesonide Turbohaler 100mcg 2 doses BD

SABA OPTIONS INCLUDE:

- Salbutamol Easyhaler 100mcg
- Terbutaline Turbohaler 500mcg

OR

MDI

ICS OPTIONS INCLUDE:

- Clenil Modulite 200mcg + spacer 1 dose BD
- Soprobec 200mcg + spacer 1 dose BD
- Qvar Easi-Breathe 100mcg 1 dose BD

SABA OPTIONS INCLUDE:

- Salamol 100mcg + spacer
- Salamol Easi-Breathe100mcg

STEP 2: PERSISTENT ASTHMA

Change to **regular low-dose** ICS/LABA inhaler

Fixed dose:
See individual inhalers below
Prescribe PRN SABA

MART Regime:
1 inhalation twice daily
plus PRN ICS/LABA
Stop PRN SABA

FIXED-DOSE/MART OPTIONS INCLUDE:

- Fostair NEXThaler 100/6 1 dose BD or MART regime
- Symbicort Turbohaler 200/6 1 dose BD or MART regime
- Fobumix Easyhaler 160/4.5 1 dose BD or MART regime
- DuoResp Spiromax 160/4.5 1 dose BD or MART regime

OR

FIXED DOSE ONCE DAILY ICS/LABA (PLUS SABA) OPTIONS INCLUDE:

- Relvar Ellipta 92/22 1 dose OD *(This is a low-moderate strength ICS/LABA)*
- Alectura Breezhaler 125/62.5mcg 1 dose OD

OR

FIXED-DOSE/MART OPTIONS INCLUDE:

- Fostair MDI 100/6 + spacer 1 dose BD or MART regime
- Luforbec MDI 100/6 + spacer 1 dose BD or MART regime

STEP 3: ADD-ON THERAPIES

Trial of montelukast 10mg nocte

Discontinue if no benefit after 6 weeks

Find out more here

Asthmahub

Get your patients to download the AsthmaHub App

DID YOU KNOW?

NHS Wales has set a target to reduce the proportion of high global warming potential (GWP) inhalers from more than 70% to less than 20% by 2025

PRESCRIBE A DPI PREFERENTIALLY UNLESS THE PATIENT CANNOT USE ONE

Learn more here

DPI: Dry Powder Inhaler
ICS: Inhaled Corticosteroid
LABA: Long-acting Beta2 Agonist
LAMA: Long-Acting Muscarinic Antagonist
MART: Maintenance and Reliever Therapy
MDI: Metered Dose Inhaler
PRN: *Pro re nata* 'as needed'
SABA: Short-acting Beta2 Agonist
OD: Once daily
BD: Twice a day

Low global warming potential
High global warming potential

Find out more about this guideline
icst.info/the-all-wales-asthma-management-and-prescribing-guideline

STEP 4: ONGOING POOR CONTROL

Increase to regular **moderate-dose** ICS/LABA inhaler

Fixed dose:
See individual inhalers below
Prescribe PRN SABA

MART Regime:
2 inhalations twice daily
plus PRN ICS/LABA
Stop PRN SABA

FIXED-DOSE/MART OPTIONS INCLUDE:

- Fostair NEXThaler 100/6 2 doses BD
- Symbicort Turbohaler 200/6 2 doses BD or MART regime
- Fobumix Easyhaler 160/4.5 2 doses BD or MART regime
- DuoResp Spiromax 160/4.5 2 doses BD or MART regime

OR

FIXED DOSE ONCE DAILY ICS/LABA (PLUS SABA) OPTIONS INCLUDE:

- Relvar Ellipta 92/22 1 dose OD *(This is a low-moderate strength ICS/LABA. If patient has poor control with this therapy, consider Step 5)*
- Alectura Breezhaler 125/127.5mcg 1 dose OD

OR

FIXED-DOSE OPTIONS INCLUDE:

- Fostair MDI 100/6 + spacer 2 doses BD
- Luforbec MDI 100/6 + spacer 2 doses BD

STEP 5: CONSIDER REFERRAL

Consider trial of add on LAMA. Discontinue if no benefit after 3 months.

- Add on Spiriva Respimat 2.5mcg 2 doses OD
- Trimbow MDI 87/5/9 2 doses BD *(Triple therapy containing moderate dose ICS/ LABA/LAMA)*

OR

Consider trial of increasing to high strength ICS/ LABA. Issue steroid card. Discontinue if no benefit after 3 months.

High dose ICS/LABA can only be used as part of fixed dose regime with PRN SABA. Not to be used as per MART.

Refer to secondary care for asthma phenotyping and consideration for biological therapy

HIGH-DOSE ICS/LABA (PLUS SABA)

- Fostair NEXThaler 200/6 2 doses BD
- Symbicort Turbohaler 400/12 2 doses BD
- Fobumix Easyhaler 320/9 2 doses BD
- DuoResp Spiromax 320/9 2 doses BD
- Relvar Ellipta 184/22 1 dose OD
- Alectura Breezhaler 125/260mcg 1 dose OD

OR

HIGH-DOSE ICS/LABA (PLUS SABA)

- Fostair MDI 200/6 2 doses BD + spacer

Patients requiring high strength ICS/LABA plus LAMA

These individuals have severe asthma and should be known to secondary care

Add on Spiriva Respimat 2.5mcg 2 doses OD **OR** Switch from high dose ICS/LABA to Enerzair Breezhaler 114/46/136 1 dose OD *(triple therapy containing high dose ICS/LABA/LAMA)*

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Review date: DD/MM/YYYY

RMG Version 2.4
September 2021

Designed by The Institute of Clinical Science & Technology

The All Wales COPD Management and Prescribing Guideline

Grŵp Strategaeth Meddyginiaethau Cymru Gyfan
All Wales Medicines Strategy Group

Also available in digital format

DID YOU KNOW?

NHS Wales has set a target to reduce the proportion of high global warming potential (GWP) inhalers from more than 70% to less than 20% by 2025

PRESCRIBE A DPI PREFERENTIALLY UNLESS THE PATIENT CANNOT USE ONE

Learn more here

STEP 1 INFORMATION: ASSESSMENT

COPD likelihood Checklist

Perform investigations

- **Post-bronchodilator spirometry**
- Chest X-ray (CXR)
- Full Blood Count (FBC)
- Oxygen Sats (SpO2)
- α-1 anti-trypsin (if family history of emphysema)

Red Flag Symptoms

Red Flag Symptoms

- Persistent cough in a smoker
- Haemoptysis
- Chest pain
- Unexplained weight loss
- Clubbing in a smoker
- Abnormal CXR

STEP 4 INFORMATION: PRESCRIBE

Phenotype 1

COPD with predominant breathlessness

Dyspnoea with less than 2 exacerbations per year

Phenotype 2

COPD with Exacerbation (+/- Breathlessness)

Two or more exacerbations per year

Phenotype 3

COPD with asthma overlap (ACOS)

Evidence of significant symptomatic or lung function response to steroids (oral or inhaled). Blood eosinophil counts >0.3

ACOS: Asthma COPD overlap syndrome
CXR: Chest X-ray
DPI: Dry Powder Inhaler
GWP: Global warming potential
FBC: Full Blood Count
ICS: Inhaled Corticosteroid
LABA: Long-acting Beta2 Agonist
LAMA: Long Acting Muscarinic Antagonist
LLN: Lower limit of normal
MDI: Metered Dose Inhaler
SABA: Short-acting Beta2 Agonist
SpO2: Oxygen Sats
OD: Once daily
BD: Twice a day

Low global warming potential
High global warming potential

Find out more about this guideline
icst.info/the-all-wales-copd-and-management-prescribing-guideline

The All Wales COPD Management and Prescribing Guideline

CORE PRINCIPLES

People aged over 35 years who present with one or more features from the COPD likelihood checklist should have post-bronchodilator spirometry.

Once diagnosis is confirmed, start with high-value interventions, including smoking cessation, flu vaccination, pulmonary rehabilitation and, where appropriate, oxygen therapy.

Inhaled therapy is prescribed according to the patient's phenotype.

STEP 1: ASSESSMENT

COPD likelihood checklist

- ☑ Smoking history (>20 pack years)
- ☑ Other exposures (Pollution, biomass fuel burning, other noxious fume exposure)
- ☑ Exertional breathlessness
- ☑ Chronic cough
- ☑ Regular sputum production
- ☑ Frequent winter 'bronchitis'
- ☑ Wheeze
- ☑ Ankle swelling

Any red flag symptoms?
Perform CXR and refer as urgent suspected cancer

STEP 2: DIAGNOSIS

Post-bronchodilator
FEV1/FVC ratio <LLN

STEP 3: REFER

- ☑ Vaccination - Flu - COVID - Pneumococcal
- ☑ Exercise, education & pulmonary rehabilitation
- ☑ Smoking cessation therapy if required
- ☑ Referral for oxygen assessment if SpO2 is <93% and not smoking
- ☑ Dietary advice Refer if low or high BMI

STEP 4: PRESCRIBE

Phenotype 1	Phenotype 2	Phenotype 3
Prescribe LABA + LAMA	**Prescribe LABA + LAMA**	**Prescribe LABA + ICS**
If continued breathlessness that limits daily activities *Check inhaler technique, response and adherence*	If continued exacerbations or breathlessness *Check inhaler technique, response and adherence*	If continued exacerbations or breathlessness or symptoms of poor control of asthma *Check inhaler technique, response and adherence*

If symptoms are stable follow up and if symptoms are worsening continue pathway

Prescribe Triple therapy	**Prescribe Triple therapy**
If continued exacerbations or breathlessness *Check inhaler technique, response and adherence*	If continued exacerbations or breathlessness or symptoms of poor control of ACOS *Check inhaler technique, response and adherence*

STEP 5: REVIEW

Review annually if COPD is well controlled

Poorly controlled?

Consider:

- Inhaler technique
- Non-pharmacological interventions
- Smoking status

If symptoms worsen, consider referral

Manage exacerbations

- Prescribe a SABA
- Prescribe prednisolone (30-40mg once a day for 5 days)
- Prescribe antibiotic if increased sputum purulence, volume and breathlessness

Find out more here

COPDhub

Get your patients to download the COPD App

STEP 4 INFORMATION: PRESCRIBE

Prescribe a (LABA + LAMA)

Below are options in this category

- Duaklir Genuair 340/12 1 dose BD *Forceful and deep*
- Ultibro Breezhaler 85/43 1 dose OD *Forceful and deep*
- Anoro Ellipta 55/22 1 dose OD *Forceful and deep*
- Spiolto Respimat 2.5/2.5 2 doses OD *Gentle and deep*
- Bevespi Aerosphere 7.2/5 2 doses BD via spacer *Gentle and deep via spacer*

Ensure patient can use device. All MDIs must be used with a spacer

Prescribe an (ICS + LABA)

Below are options in this category

- Fobumix easyhaler 320/9 1 dose BD *Forceful and deep*
- Relvar ellipta 92/22 1 dose OD *Forceful and deep* Check licensed indications
- Symbicort turbohaler 400/12 1 dose BD *Forceful and deep*
- Fostair NEXThaler 100/6 2 doses BD *Forceful and deep*
- DuoResp Spiromax 160/4.5 2 doses BD *Forceful and deep*
- Fostair MDI 100/6 2 doses BD via spacer *Gentle and deep via spacer*

Ensure patient can use device. All MDIs must be used with a spacer

Prescribe triple therapy

Below are options in this category

- Trelegy Ellipta 92/55/22 1 dose OD *Forceful and deep*
- Trimbow NEXThaler 88/5/9 2 dose BD *Forceful and deep*
- Trimbow MDI 87/5/9 2 doses BD via spacer *Gentle and deep via spacer*
- Trixeo Aerosphere 5.7/2.160 2 doses BD via spacer *Gentle & deep via spacer*

Ensure patient can use device. All MDIs must be used with a spacer

Manage Exacerbations Prescribe a SABA

Below are options in this category

- Salbutamol 100mcg Easyhaler PRN *Forceful and deep*
- Salamol 100mcg MDI via spacer PRN *Gentle and deep via spacer*
- Salamol Easi-Breathe 100mcg PRN *Gentle and deep*

Ensure patient can use device. All MDIs must be used with a spacer

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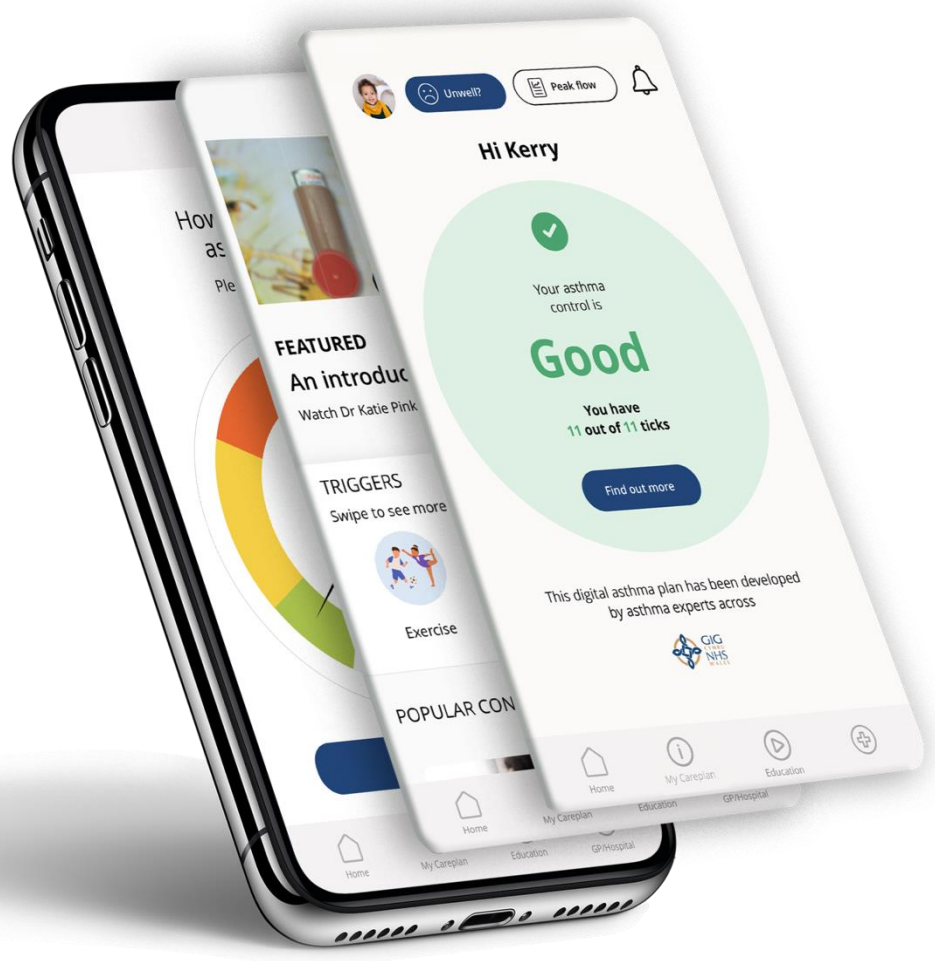
Designed by The Institute of Clinical Science & Technology

COPDhub

Asthmahub For Parents

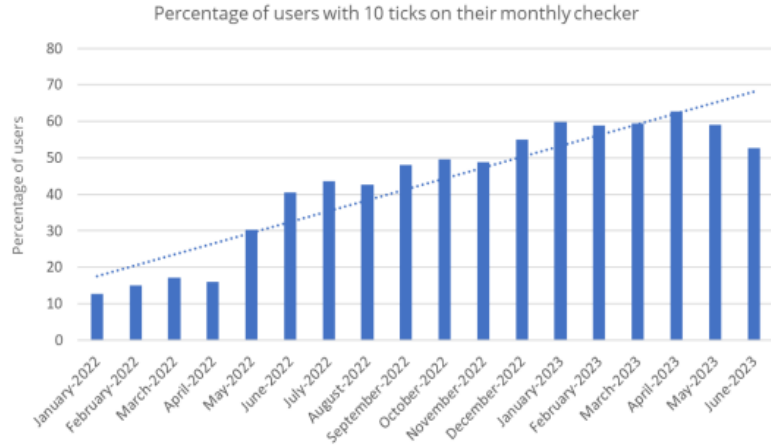
Asthmahub



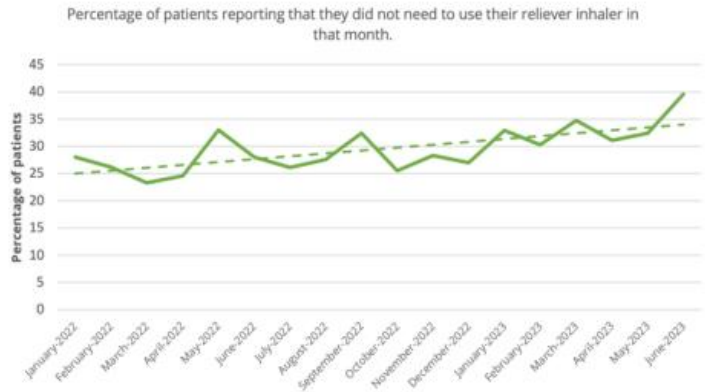
Respiratory patient apps

- Helping you to help your patients
- Enhancing the values and techniques of self-management
- Supporting your patients to stay well
- Empowering your patients to drive standards of care

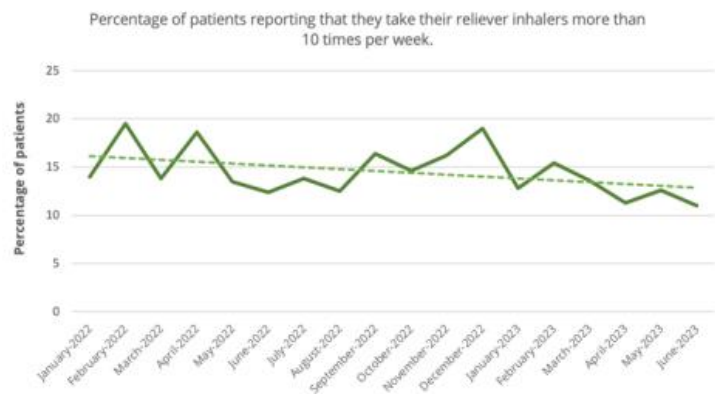
The proportion of users classified as 'good' increased by *300%* in 18 months, from 17% in January 2022 to 68% in June 2023.



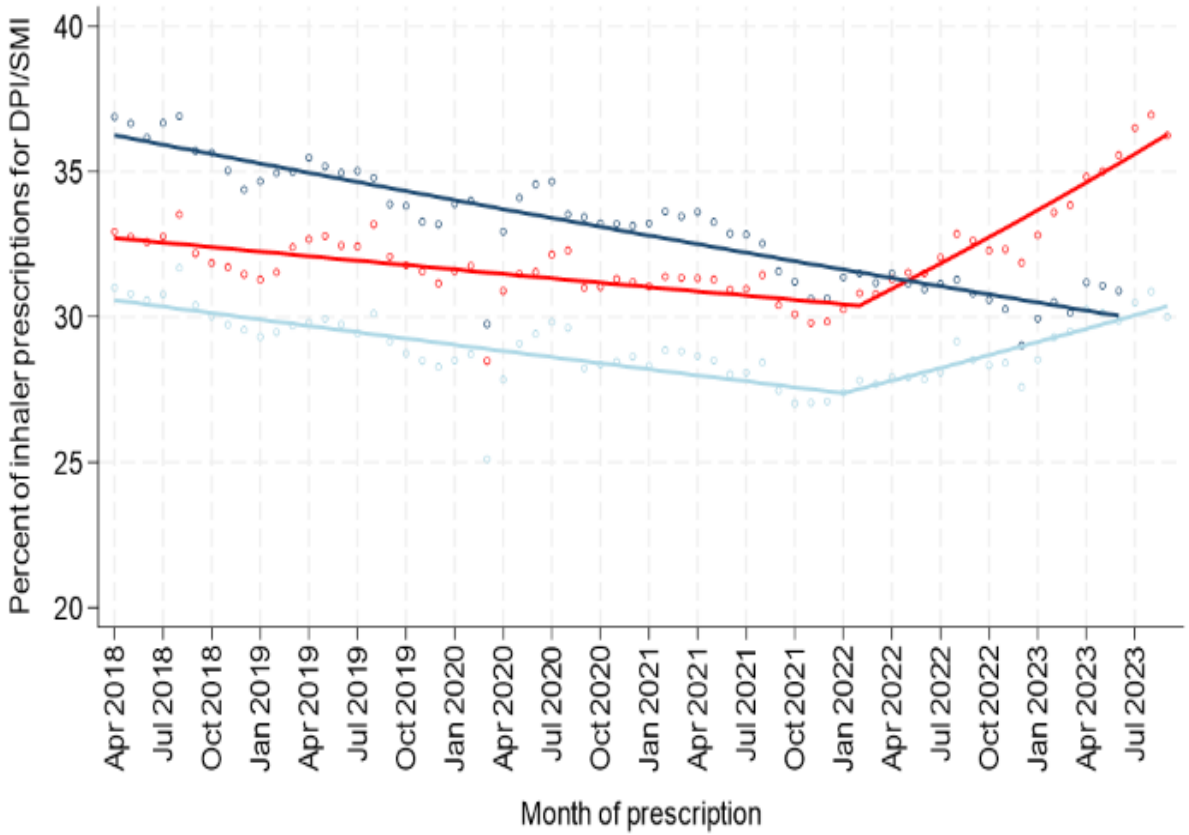
A 36% increase in the proportion of users who did not use their reliever inhaler during the month. *Trendline averages show a rise from 25% in January 2022 to 34% in June 2023.*

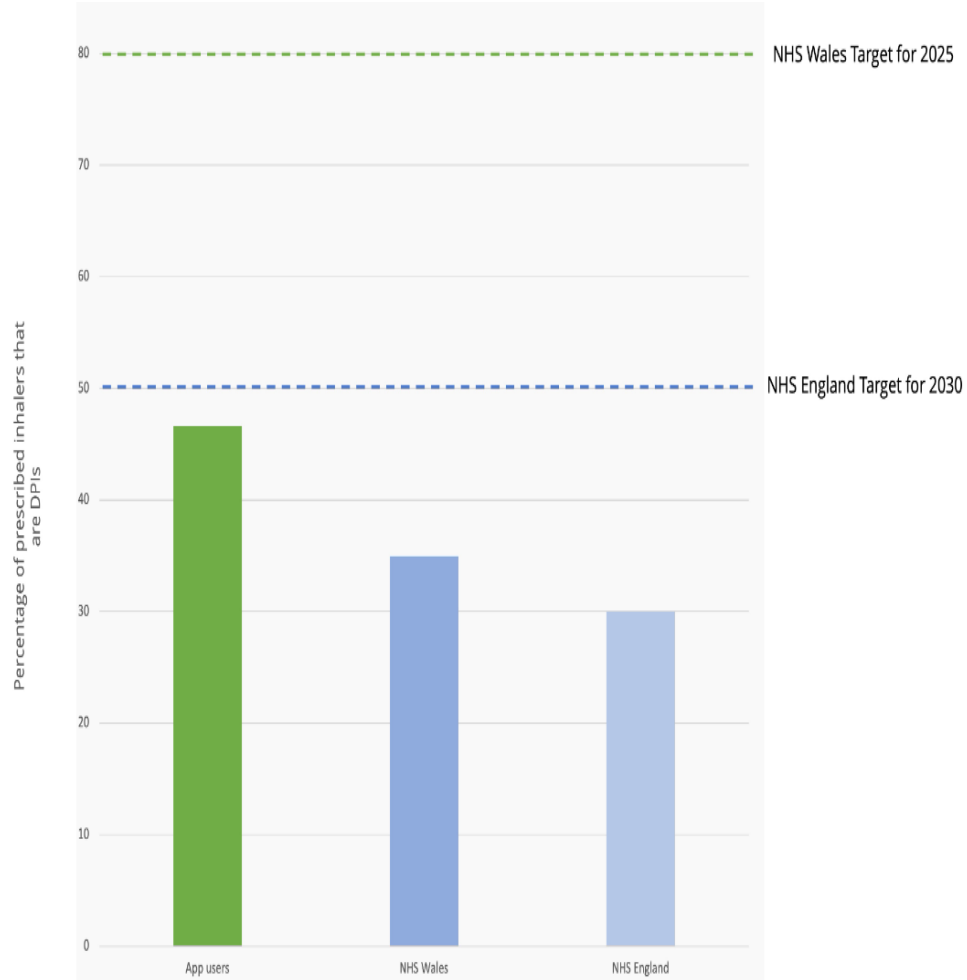


A 19% decrease in users who used their reliever inhaler more than 10 times per week.



With the updated data for E, W & S.





Conclusions

- CRP is an effective tool to reduce antibiotic prescribing without increasing patient risk
- There is good evidence to support using the PACE algorthim for COPD exacerbations
- In Wales there is a well integrated respiratory toolkit that could facilitate uptake of POC CRP testing by communicating directly to patients and HCP about changes in practice