

Annual Scientific Meeting 2019

12th - 13th March, 2019: Friends House, London

Celebration of the first 5 years
and vision for the next 5 years
of the Asthma UK Centre for
Applied Research



Asthma UK Centre
for Applied Research



www.aukcar.ac.uk



@AUKCAR

#ASM19

Additional
funding leveraged
£24.6 million

Total of **23** PhD students



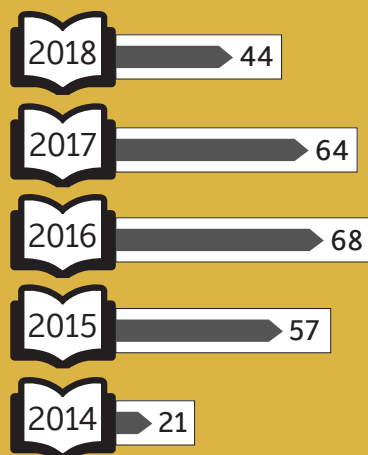
SOME NUMBERS

REACH Register for
Asthma researchCH

Over **100**
people registered



Publications



March 2019

Dear Friends

It is our great pleasure to welcome you to the Asthma UK Centre for Applied Research Annual Scientific Meeting 2019.

Recent successes

Since its launch in 2014, our Centre has been at the forefront of research making a real difference to the lives of those affected by asthma.

Over the past year, our network of world-leading researchers has contributed to important advances on (amongst others) the topics of air pollution, online health communities and female hormones in asthma.

2018 also saw the launch of ground-breaking new studies, including CHILL, which will evaluate the impact of London's Ultra Low Emission Zone on children's health, and IMP²ART, which aims to help general practices embed supported self-management into routine asthma care.

It's also been fantastic to see our first PhD students begin to graduate. Developing the next generation of world-class applied asthma researchers through our postgraduate training programme is a key role of the Centre.

Looking forward

As we gather together to celebrate our achievements over the first five years of the Centre, we also embark on a new chapter.

We are delighted to announce that the Asthma UK Centre for Applied Research has been funded for an additional five years. We are exceptionally grateful to Asthma UK for this further support. Our vision for the Centre during this next period will be explored over the course of the meeting.

Collaboration is at the heart of what we do, and we're thrilled to formally welcome the Universities of Leeds, Oxford and Southampton as full members of the Centre as part of our renewal.

As we reach this important milestone, we'd like to take this opportunity to thank you for your continued support of the Centre. Our overarching principle, as recommended by *The Lancet Commission on Asthma*, is "Zero tolerance of asthma attacks". We look forward to working together as a network to build on our achievements over the past five years and create lasting impact for people with asthma throughout the UK and beyond.

Aziz Sheikh Chris Griffiths

Aziz and Chris

Professor Aziz Sheikh, University of Edinburgh, and Professor Chris Griffiths, Queen Mary University of London

Co-Directors of the Asthma UK Centre for Applied Research

Locations: Refreshments - Conference foyer
 Posters - Ada Salter Suite
 Talks - THE LIGHT

Day 1: Tuesday 12th March – celebration of AUKCAR work

Time	Event	Speakers
09.00 – 09.30	Registration and coffee	
09.30 – 09.35	Welcome	Aziz Sheikh
09.35 – 09.55	Vision, approach and overview of achievements	Aziz Sheikh & Chris Griffiths
09.55 – 11.10	Research success and key messages <i>Chair: Aziz Sheikh</i> Results from selected projects in the following areas: • Self management (25min)	Hilary Pinnock, Susan Morrow, Kirstie McClatchey & Io Hui
	• Precision medicine (25min) • At-risk asthma (25min)	Rob Horne Andrew Wilson & Susannah McLean
11.10 – 11.15	Group photograph	
11.15 – 11.40	Coffee/Tea Posters	
11.40 – 12.30	Keys to success <i>Chair: Chris Griffiths</i> • Data and methodology (Observatory, REACH, methodology) (20min) • Patient & Public Involvement (15min) • Postgraduate Training and alumni network (15min)	Steff Lewis, Chris Newby, Tracy Jackson & Mome Mukherjee Anna de Simoni, Tracy Jackson & Olivia Fulton Gwyn Davies & Tracy Jackson Stan Szeffler
12.30 – 13.00	Plenary: Technology, asthma and the future <i>Chair: Chris Griffiths</i>	
13.00 – 14.00	Lunch Posters - presenters will be by their posters from 13.30	
14.00 – 14.45	Asthma in real life : today's dilemmas and future solutions <i>Chair: Monica Fletcher</i> Panel/audience discussion Gwyn Davies, Rob Horne, Steff Lewis, Daniel Russell, Anna de Simoni	
14.45 – 15.30	Looking ahead: The next 5 years for AUKCAR <i>Chair: Aziz Sheikh</i> • Overview of plans and approach for AUKCAR 2 (10min) • Leveraging major external resources (10min) • Examples of key projects 1. Improving asthma diagnosis (5min) 2. Online asthma communities (5min) 3. CHILL (5min) • Discussion (10min)	Aziz Sheikh Chris Griffiths Luke Daines Anna de Simoni Chris Griffiths
15.30 – 16.00	Coffee/Tea Posters	
16.00 – 16.30	Plenary: Celebrating the past and looking to the future <i>Chair: Aziz Sheikh</i>	Erika von Mutius
16.30 – 16.40	Round-up of the day and closing comments	Aziz Sheikh
17.00 – 18.00	IAB meeting - room TBC	IAB members and Centre Directors
19.00	Drinks reception followed by Conference Dinner Ambassador Bloomsbury Hotel	

Day 2: Wednesday 13th March

Time	Event	Speakers
09.00 – 09.30	Centre AGM and feedback from the IAB - All welcome <i>Chair: Aziz Sheikh & Chris Griffiths</i>	
09.30 – 10.00	A practical look ahead – next 5 years • Structure • Priorities • Resources	Aziz Sheikh, Chris Griffiths, Andrew Wilson, Hilary Pinnock, Steff Lewis & Gwyn Davies
10.00 – 11.00	Methodology: Evaluating asthma apps <i>Chair: Chris Newby</i>	Chris Newby
11.00 – 11.30	Coffee/Tea Posters	
11.30 – 12.15	New from the Centre (3x15min talks) <i>Chairs: Mike Shields & Holly Tibble</i> O1: Defining Near Fatal asthma – an international eDelphi study O2: Developing a value pyramid to guide implementation of asthma interventions in the UK O3: Identifying patients with asthma-chronic obstructive pulmonary disease overlap syndrome using latent class analysis of electronic health record data	Ann McMurray Chris Roukas Mohammad Al Sallakh
12.15 – 12.45	Patient and Public Involvement <i>Chair: Anna de Simoni</i>	Anna de Simoni Allison Worth, Elisabeth Ehrlich, Olivia Fulton, Holly Tibble, Elsie Horne & Kirstie McClatchey
12.45 – 14.15	Lunch Posters – presenters will be by their posters from 13.15	
14.15 – 15.15	New from the Centre (4x15min talks) <i>Chairs: Steve Cunningham & Elsie Horne</i> O4: Exploring primary care staff experiences of financial incentives for implementing asthma self-management: a qualitative study in Northern Ireland using normalization process theory. O5: Identifying strategies to overcome roadblocks towards utilising near-real time healthcare and administrative data to create a Scotland-wide learning health system (LHS) for asthma. O6: Asthma and early exit from employment: a European cohort study. O7: The 25-hydroxyvitamin D response to vitamin D supplementation is blunted in adults with asthma and COPD.	Tracy Jackson Mome Mukherjee Boby Mihaylova Christos Stefanidis
15.15 – 15.45	Plenary: Acute asthma: treatable and preventable <i>Chair: Chris Griffiths</i>	Carlos Camargo
15.45 – 16.00	Prizes and closing comments	

Oral Presentations

Wednesday 13th March: 11.30-12.15

Please note that oral presentations 01-07 are the same as posters 17-23.

Oral presentation 01* (Poster 18)

Defining Near Fatal asthma – an international eDelphi study.

McMurray A, Fleming L, Cunningham S.

Oral presentation 02* (Poster 21)

Developing a value pyramid to guide implementation of asthma interventions in the UK.

Roukas C, Tomini F, Griffiths C, Roberts CM, Mihaylova B.

Oral presentation 03* (Poster 23)

Identifying patients with asthma-chronic obstructive pulmonary disease overlap syndrome using latent class analysis of electronic health record data.

Mohammad Al Sallakh, Sarah E Rogers, Ronan A Lyons, Aziz Sheikh & Gwyneth A Davies

Wednesday 13th March: 14.15-15.15

Oral presentation 04* (Poster 17)

Exploring primary care staff experiences of financial incentives for implementing asthma self-management: a qualitative study in Northern Ireland using normalization.

Jackson T, Kendall M, Shields M, Heaney L, Pinnock H

Oral presentation 05* (Poster 19)

Identifying strategies to overcome roadblocks towards utilising near-real time healthcare and administrative data to create a Scotland-wide learning health system (LHS) for asthma.

Mukherjee M, Cresswell K, Sheikh A

Oral presentation 06 (Poster 20)

Asthma and early exit from employment: a European cohort study.

Leveneur P, Newby C, Mihaylova B.

Oral presentation 07* (Poster 22)

The 25-hydroxyvitamin D response to vitamin D supplementation is blunted in adults with asthma and COPD.

Stefanidis C, Jolliffe DA, Griffiths CJ, Bush A & Martineau AR.

Oral presentation 1*

Defining Near Fatal asthma – an international eDelphi study.

¹McMurray A, ²Fleming L, ¹Cunningham S,

¹University of Edinburgh; ²Imperial College, London.

Background: National and international asthma guidelines categorise the severity of asthma attacks into mild, moderate and severe/life threatening episodes with guidance on clinical signs and objective measurements identified for each. In those who experience a particularly severe asthma attack there is a penultimate event which, if not recognised, will result in death. The name for this attack varies and requires clarity and definition to enable the frequency of defined attacks to be measured, against which future interventions can be trialled to reduce these and asthma deaths.

Aims: To gain an international clinical consensus definition for this penultimate attack and agree an appropriate name.

Methods: An eDelphi survey was conducted with international experts in the fields of both paediatric and adult respiratory, intensive care and emergency medicine. A series of structured questionnaire was used to reach consensus on a name for the event, clinical features, objective measurements and other features. Consensus was defined in advance as $\geq 70\%$ agreement.

Results: 104 participants from 25 countries completed all three rounds of the Delphi. Near fatal asthma was the preferred name for this event (66%). Participants reached consensus on the following definition: A near fatal asthma attack occurs in a person who is exhausted, with severe dyspnoea, unable to speak with a silent chest. Respiratory arrest is considered imminent and invasive ventilation will likely be required. They will be responding poorly to emergency asthma therapies. This is associated with hypoxaemia, hypercarbia and a falling pH.

Conclusions: The eDelphi procedure resulted in a comprehensive definition of a near fatal asthma attack which will be used in future work to determine eligibility criteria for studies of near fatal asthma and devise treatment pathways.

Funding: This work is funded by the University of Edinburgh College of Medicine and Veterinary Medicine PhD Studentship (AUKCAR PhD/15/01)

Oral presentation 2*

Developing a value pyramid to guide implementation of asthma interventions in the UK.

¹Roukas C, ¹Tomini F, ¹Griffiths C, ²Roberts CM, ¹Mihaylova B

¹Centre for Primary Care and Public Health, Queen Mary University of London; ²UCLPartners

Background: A range of interventions are employed to manage asthma in UK. However, a value pyramid to assist policy makers, commissioners and clinicians in prioritising implementation is unavailable.

Aim: To develop a cost-effectiveness value pyramid of asthma interventions in the UK NHS using incremental cost-effectiveness ratio (ICER) per quality-adjusted life year (QALY) evidence.

Methods: A review of asthma interventions in current use and their cost-effectiveness evidence with focus on UK healthcare perspective. Firstly, interventions and cost-effectiveness results were extracted from NICE asthma guidelines and technology appraisals. Secondly, results were extracted from our recent in-house systematic review of economic evaluations in asthma (5 databases searched for the period 1990–2017). Thirdly, to address gaps in evidence among people with asthma, for highly relevant interventions (e.g. flu vaccination, stop smoking interventions), results from NICE appraisals in general populations were extracted. Finally, the economic evaluations outside the UK informed interventions without UK evidence. The incremental cost, effects and ICERs were extracted with costs converted to 2017UK£.

Interim results: The highest value interventions were: stop smoking services (ICER £13 - £3,734 per QALY), outpatient asthma clinics (£1,511), flu vaccination (£3,039 - £4,819), leukotriene receptor antagonists (LTRAs) in children (£7,441) and temperature-controlled laminar airflow devices (£9,467). Likely to be cost effective were: salmeterol xinafoate/fluticasone propionate combination inhaler for children (£14,567 - £19,673), long-acting beta-agonists (LABAs) (£13,138 in children and £10,184 - £18,358 in adults) and asthma self-management (£15,223 - £23,051). However, LTRAs in adults (£29,365), salmeterol xinafoate/fluticasone propionate combination inhaler

for adults (£79,670) and omalizumab (£33,722 - £87,370 in children and £35,595 - £64,463 in adults) were not cost-effective. Emerging results suggest differences in value between adult and paediatric asthma populations particularly for newer and more expensive interventions.

On-going work: Impact of study quality on conclusions is being assessed. The lack of relevant cost-effectiveness evidence, variation in methods and study populations poses challenges.

Trial registration: (not applicable)

Funding: No external funding

Oral presentation 3*

Identifying patients with asthma-chronic obstructive pulmonary disease overlap syndrome using latent class analysis of electronic health record data.

Mohammad Al Sallakh, Sarah E Rodgers, Ronan A Lyons, Aziz Sheikh & Gwyneth A Davies

Background: Asthma and chronic obstructive pulmonary disease (COPD) are two common different clinical diagnoses with overlapping clinical features. Both conditions have been increasingly studied using electronic health records (EHR). Asthma-COPD overlap syndrome (ACOS) is an emerging concept where clinical features from both conditions co-exist, and for which, however, there is no consensus definition. Nonetheless, we expect EHR data of people with ACOS to be systematically different from those with “asthma only” or “COPD only”.

Aims: We aim to develop a latent class model to understand the overlap between asthma and COPD in EHR data and to identify patients with ACOS using these data.

Methods: From the Secure Anonymised Information Linkage (SAIL) Databank of Wales, we will use routinely collected data related to asthma and/or COPD and recorded in or before 2014 for people who aged 40 years or more on 1 Jan 2014. A set of ordinal variables will be constructed from these data and used to specify latent class models with varying numbers of classes. We will select the best fit model based on model diagnostics and clinical interpretability, and will describe its latent classes using their item-response probabilities. Based on the developed latent class model, we will train a classification algorithm and compare its performance with commonly used objective and self-reported case definitions for asthma and COPD.

Progress made: Informed by a previously developed latent class model to identify patients with asthma, we developed an extended set of variables related to asthma and/or COPD, including diagnosis, primary care visits and prescriptions, lung function tests, eosinophil counts, as well as secondary care utilisation. These variables will be used to specify latent class models for asthma-COPD overlap.

Discussion: While we expect asthma-COPD overlap to be reflected in EHR data, the clinical meaning and usefulness of the latent classes that will be identified will depend on data quality and how the observed variables are chosen and constructed. There will be levels of subjectivity in the construction of the observed variables, model selection and interpretation. The resulting classification algorithm is intended to be used to identify people with ACOS, ‘asthma only’, and ‘COPD only’ in EHR databases.

Oral presentation 4*

Exploring primary care staff experiences of financial incentives for implementing asthma self-management: a qualitative study in Northern Ireland using normalization.

¹Jackson T, ¹Kendall M, ²Shields M, ²Heaney L, ¹Pinnock H

¹University of Edinburgh; ²Queens University Belfast

Background: In 2008, Northern Ireland introduced a healthcare scheme that pays a financial incentive to general practices for providing self-management education, including an asthma action plan, to patients with asthma.

Aim: To explore how primary care staff responded to the introduction of this scheme and how they implemented new processes into their practice routines.

Methods: Qualitative interviews were conducted to explore staff response to the healthcare scheme and perceptions of its impact on the implementation of asthma self-management. Interviews were recorded, transcribed verbatim and analysed using a framework informed by the Normalization Process Theory (NPT).

Results: 23 participants (five GPs; five nurses; 13 administrative staff) from 15 primary care practices across Northern Ireland provided 15 semi-structured telephone interviews, six individual in-depth interviews and two group interviews. Processes created since the introduction of the scheme appear successfully embedded into primary care practice routines. Multi-disciplinary teams and working together were continually discussed by participants in relation to the scheme, from inception to implementation and delivery in primary care practices. Significant support from the Public Health Agency and pharmaceutical companies in providing funding and training for nurses was acknowledged as a key to the successful embedding of new processes, but there was concern regarding reduction in funding from both of these sources and the impact on the future provision of asthma self-management education in primary care.

Conclusions: The NPT assisted in identifying the enablers and barriers to the implementation of the scheme in general practice in Northern Ireland. Primary care staff identified multi-disciplinary teamwork throughout the lifespan of the scheme as key to its “normalization”, which was now so embedded that concerns were expressed that threats to funding and withdrawal of external support. Understanding how practices “normalized” this healthcare scheme could inform further policy on similar initiatives.

Funding: The University of Edinburgh CMVM PhD Studentship [Asthma UK Centre for Applied Research PHD/14/16]

Oral presentation 5*

Identifying strategies to overcome roadblocks towards utilising near-real time healthcare and administrative data to create a Scotland-wide learning health system (LHS) for asthma.

¹Mukherjee M, ²Cresswell K, ³Sheikh A

^{1,2,3} Asthma UK Centre for Applied Research, The University of Edinburgh

Background: We are working towards the creation of a national learning health system (LHS) for asthma, which we hope will support efforts to reduce asthma attacks and associated hospitalisations and deaths in Scotland. Success is however dependent on the ability to access digitised patient data in near-real time to support clinical decision-making.

Aim: To identify strategies to overcome critical roadblocks to utilising near-real time digitised patient data to support the creation of a Scotland-wide LHS for asthma.

Methods: We conducted 38 in-depth semi-structured face-to-face/telephone interviews with purposely sampled NHS staff, Scottish Government and academics across Scotland to explore the current barriers and facilitators in accessing and utilising digitised patient data. All interviews were digitally recorded, transcribed verbatim and qualitatively coded using Quirkos software. Results were analysed thematically drawing on the data lifecycle.

Results: Participants agreed that Scotland offered considerable potential to play a world-leading role in the exploitation of routinely collected data to drive forward improvements in health outcomes and research capability, but noted some major impediments in realising this vision. These included the: i) persistence of paper-based records and the variety of not interoperable information systems storing data across regions in Scotland; ii) lack of agreed and proportionate approaches to managing information governance; and iii) absence of a suitable infrastructure, capacity and capability to process data supporting research and quality improvement.

Conclusions: This work highlights the pressing need to digitise and integrate existing health information infrastructures, guided by a nationwide proportionate approach to information governance. Investing in technological and human capabilities to support these efforts will be crucial to maximise use of Scotland’s rich data-assets to enhance asthma outcomes across Scotland.

Funding: Chief Scientist Office Catalytic Research Grant (CGA1704)

Oral presentation 6

Asthma and early exit from employment: a European cohort study.

^{1,2}Leveneur P, ¹Newby C, ¹Mihaylova B,

¹Queen Mary University of London; ²ENSAE

Background: Health status determines workforce participation and people with chronic conditions may have a shortened work-life.

Aim: The impact of asthma and other chronic conditions on early exit from employment, defined as exiting the workforce before the country's retirement age was investigated overall and by exit type (early retirement, unemployment, disability, other).

Methods: Data from Survey of Health, Ageing and Retirement in Europe, a large European longitudinal study among people 50 years or older was used. Data on chronic conditions (asthma, chronic lung disease, cardiovascular disease, cancer, diabetes, musculoskeletal disease and depression) and employment were collected throughout the study. Participants in paid employment at entry and information on chronic conditions and employment during follow-up were studied. Logistic and multinomial logistic models studied associations between chronic conditions and early workforce exit overall and by exit type, adjusting for socio-demographic, job quality and country.

Results: 10,222 participants from 15 countries with median age 54 years, 54% male were included. At entry, 1162(11%) of participants had chronic lung disease, 924(9%) asthma alone, 5196(50%) cardiovascular disease, 962(9%) diabetes, 1209(12%) cancer, 665(6%) musculoskeletal disease (including osteoporosis) and 785(8%) depression. In multivariable analysis, cardiovascular disease (Odds Ratio (OR) 1.37, $p < 0.001$) and diabetes (OR 1.17, $p = 0.045$) were the only two diseases clearly associated with an overall early workforce exit. In analysis investigating associations with type of early exit, cardiovascular disease was associated with early retirement or disability benefit; diabetes and musculoskeletal diseases with disability benefit; and depression with disability benefit or unemployment. Chronic lung disease and asthma alone were not clearly associated with an early workforce exit overall or by type. Job characteristics were strongly associated with early exit.

Conclusions: In a large European cohort asthma was not associated with an early exit from employment, but may contribute to associated conditions such as depression and musculoskeletal disease.

Trial registration: NA

Funding: No external funding

Oral presentation 7*

The 25-hydroxyvitamin D response to vitamin D supplementation is blunted in adults with asthma and COPD.

Stefanidis C,¹ Jolliffe DA,¹ Griffiths CJ,¹ Bush A² & Martineau AR¹

¹ Centre for Primary Care and Public Health, Queen Mary University of London, London, UK

² Faculty of Medicine, National Heart & Lung Institute, Imperial College London, London, UK

Background: Inflammatory diseases may alter the metabolism of Vitamin D. This could alter the ability of vitamin D supplementation to increase serum concentrations of 25-hydroxyvitamin D (25[OH]D), its major circulating metabolite. We hypothesized that the rise in plasma 25(OH)D with a standard dose of vitamin D have not been compared in patients with inflammatory airways disease would be less than those of healthy controls.

Method: We analysed baseline and 1 year 25(OH)D concentrations in adults with asthma (N=125), with chronic obstructive pulmonary disease (COPD) (N=122) and otherwise healthy controls (N=137) who had been randomised to the intervention arm of clinical trials of vitamin D supplementation. Multiple linear regression compared the effect of supplementation with six 2-monthly oral doses of 3 mg (120,000 IU) vitamin D3 on 1-year serum 25(OH)D concentrations between groups, adjusting for baseline 25(OH)D concentration, age, ethnicity, sex, body mass index, smoking status and vitamin D supplementation,

Results: In an adjusted model, patients with asthma had -16.9 nmol/L lower post-supplementation 25(OH)D concentration (95% CI; -29.0 to -4.9, $p = 0.006$) compared to healthy controls (mean 25(OH)D of 86.5 nmol/L). Similarly, patients with COPD had -18.9 nmol/L lower post-supplementation 25(OH)D concentration compared to healthy controls (95% CI; -31.2 to -6.76, $p = 0.002$).

Conclusions: Adults with asthma and COPD had blunted 25(OH)D responses to vitamin D supplementation, as compared to controls with neither condition. Determining whether this relates to adherence or the effects of inflammation requires further work. For whatever reason, people patients with inflammatory airway disease may need increased doses of vitamin D supplements than healthy controls in order to optimise vitamin D status.



CHILL

Poor air quality is linked with stunted lung growth in London primary school children and the London Low Emission Zone (LEZ) had limited impact



Vitamin D

The first convincing evidence for the benefits of vitamin D supplements to reduce risk of asthma attacks and hospital admissions

SCIENTIFIC HIGHLIGHTS



SIVE II

Flu vaccine prevents about two-thirds of asthma attacks that lead to emergency visits and/or hospital admissions



IMPART

PRISMS

Supported self-management of patients greatly reduces the risk of asthma attacks

Poster Sessions

Tuesday 12th March: 13:30-14.15

Wednesday 13th March: 13:15-14.15

Poster 1*: *Predicting asthma attacks in primary care: protocol for developing a machine learning-based prediction model.*

Tibble, H, Tsanas, A, Horne, E, Horne, R, Mizani, M. A., Simpson, C. R., Sheikh, A.

Poster 2*: *Clinical prediction models to support the diagnosis of asthma in primary care: a systematic review*
Luke Daines, Susannah McLean, Audrey Buelo, Steff Lewis, Aziz Sheikh, Hilary Pinnock.

Poster 3: *Is Poor Asthma Self-Management Due to Failure to Recognise Symptoms or Failure to Act? Novel Insights from Mining Large-Scale Clinical Observational Study*
Syed Ahmar Shah

Poster 4: *Using information on all previous exacerbations to predict future risk of attack*
Bonnett LJ, Blakey J.

Poster 5: *Stakeholder perspectives on evaluation of apps supporting asthma management*
Chris Newby, Anna Dowrick, Nicola Maayan, Sandra Eldridge.

Poster 6: *Validating the accuracy of asthma outcomes in routine UK primary care data*
Chris Newby, Neil Wright, Thomas Hamborg, Sandra Eldridge, Susan Morrow, Steven Julious, Francis Appiagyei, Derek Skinner, Victoria Carter, David Price, Steph Taylor, Hilary Pinnock

Poster 7*: *ELEVATE: evaluation of the impact of Patient and Public Involvement in the Asthma UK Centre for Applied Research.*
Olivia Fulton, Allison Worth, Tracy Jackson, Gill Highet

Poster 8: *A Patient-Centred Definition of Severe Asthma: The Patient Understanding Leading to an appropriate Severe Asthma Review (PULSAR) Initiative.*
McGuinness A, Wilson A, Fletcher M, Price D, Winders T.

Poster 9*: *The effects of anonymisation on the accuracy and generalisability of observational studies: A case study in asthma.*
Mehrddad A Mizani, Aziz Sheikh

Poster 10*: *Cluster analysis to identify asthma subtypes: a critical view of methodological considerations.*
Elsie Horne, Chris Griffiths, Aziz Sheikh, Thanasis Tsanas

Poster 11*: *Development and Feasibility Testing of a Scalable Intervention to Promote Physical Activity Among Sedentary Adults with Moderate or Severe Asthma.*
Tyson L, Wilson A, Jones A, Hardeman W, Stratton G, Davies G

Poster 12*: *Current recommendations/practices for anonymising data from clinical trials in order to make it available for sharing: A scoping review*
Rodriguez A, Tuck C, Dozier MF, Lewis SC, Eldridge S, Weir CJ

Poster 13: *Investigating the national context for supported self-management to inform the IMP2ART implementation strategy*
Renukanthan A, Sheringham J, Pinnock H, Morrow S, McClatchey K, Taylor S

Poster 14*: *IMpLementing IMProved Asthma self-management as Routine Treatment: the IMP2ART programme.*
McClatchey K, Morrow S, Taylor S, Pinnock H

Poster 15*: *Learning Health Systems: Translating current approaches into a chronic disease management framework.*
Sengupta M, Sheikh A, Simpson C

Poster 16*: *Investigating the Burden of Asthma coMorbidity (IBAM): a retrospective cohort study.*
Karim El Ferkh, Bright I Nwaru, Chris Weir, Chris Griffiths, Aziz Sheikh A

Please note that posters 17-23 are the same as oral presentations 01-07. See pages 5 to 9 for full details.

Poster 1*

Predicting asthma attacks in primary care: protocol for developing a machine learning-based prediction model.

Tibble H, ^{1,2} Tsanas A, ^{1,2} Horne E, ^{1,2} Horne R, ^{2,3} Mizani MA, ^{1,2} Simpson CR, ^{4,2} Sheikh A ^{1,2}

¹Usher Institute of Population Health Sciences and Informatics, Edinburgh Medical School, College of Medicine and Veterinary Medicine, University of Edinburgh – Teviot Place, Edinburgh, United Kingdom

²Asthma UK Centre for Applied Research, Usher Institute of Population Health Sciences and Informatics, Centre for Medical Informatics, The University of Edinburgh, Edinburgh, UK

³Centre for Behavioural Medicine, Department for Practice and Policy, UCL School of Pharmacy, University College London – Mezzanine Floor, London, United Kingdom

⁴School of Health, Faculty of Health, Victoria University of Wellington, Wellington, New Zealand

Background: Asthma is a long-term condition with rapid onset worsening of symptoms which can be unpredictable and fatal. Prediction models require high sensitivity to minimise mortality risk, and high specificity to avoid unnecessary prescribing of preventative medications that come with a risk of adverse events.

Aim: To create a risk score to predict asthma attacks in primary care using a statistical learning approach trained on routinely collected Electronic Health Record (EHR) data. We will investigate the potential added value across various metrics (including sensitivity and specificity) by extending the statistical learning model, incorporating information extracted from linked secondary care records in addition to the primary care EHR data.

Methods: We will employ various machine learning classifiers (such as naïve Bayes, support vector machines, and random forests) to create an asthma attack risk prediction model, using the Learning Health System study patient registry comprising 500,000 individuals from across 75 Scottish general practices, with linked longitudinal primary care prescribing records, primary care Read codes, accident and emergency records, hospital admissions and deaths. Models will be compared on a partition of the dataset reserved for validation, and the final model will be tested in both an unseen partition of the derivation dataset and in an external dataset (from the Seasonal Influenza Vaccination Effectiveness II study).

Interim results (or Progress made): The protocol paper for this work has been submitted for publication, and the script for the analysis (R) and Read coding have been commenced.

On-going challenges (or Points for discussion): Specifications of the Read codes to be used for covariates.

Funding: HT is supported by College of Medicine and Veterinary Medicine PhD (eHERC/Farr Institute) Studentships from The University of Edinburgh. EH is supported by a Medical Research Council PhD Studentship (eHERC/Farr). MAM's Newton International Fellowship is awarded by the Academy of Medical Sciences and Newton Fund. This work is carried out with the support of the Asthma UK Centre for Applied Research [AUK-AC-2012-01] and Health Data Research UK, an initiative funded by UK Research and Innovation Councils, National Institute for Health Research (England) and the UK devolved administrations, and leading medical research charities. The LHS dataset was created with funding from the National Environment Research Council [NE/P011012/1]. The SIVE II dataset was created with funding from the National Institute for Health Research (NIHR) Health Technology Assessment programme [13/34/14] - the views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Health Technology Assessment programme, NIHR, NHS or the Department of Health.

Poster 2*

Clinical prediction models to support the diagnosis of asthma in primary care: a systematic review

Luke Daines¹, Susannah McLean¹, Audrey Buelo², Steff Lewis³, Aziz Sheikh¹, Hilary Pinnock¹

¹Asthma UK Centre for Applied Research, Usher Institute of Population Health Sciences and Informatics, The University of Edinburgh

²Scottish Collaboration for Public Health Research and Policy, The University of Edinburgh

³Edinburgh Clinical Trials Unit, Usher Institute of Population Health Sciences and Informatics, The University of Edinburgh

Background: Diagnosing asthma is challenging. Mis-diagnosis can lead to untreated symptoms, incorrect treatment and avoidable deaths. The best combination of clinical features and tests to achieve a diagnosis of asthma is unclear. As asthma is usually diagnosed in non-specialist settings, a clinical prediction model to aid

assessment of the probability of asthma in primary care may improve diagnostic accuracy. We aimed to identify and describe existing prediction models to support the diagnosis of asthma in children and adults in primary care.

Methods: We searched Medline, Embase, CINAHL, TRIP and U.S. National Guidelines Clearinghouse databases from 1/1/1990 to 23/11/17. We included prediction models designed for use in primary care or equivalent settings to aid diagnostic decision-making of clinicians assessing patients with symptoms suggesting asthma. Two reviewers independently screened titles/abstracts/full-texts for eligibility, extracted data, and assessed risk of bias.

Results: From 13,798 records, 53 full-text articles were reviewed. Seven modelling studies (8 papers) were included; all studies were at high risk of bias. Patient-reported wheeze, symptom variability and history of allergy or allergic rhinitis, were associated with asthma. Two studies used data from clinical tests, spirometry and fractional exhaled nitric oxide, as predictors.

Conclusion: Clinical prediction models may support the diagnosis of asthma in primary care, but existing models are at high risk of bias and thus unreliable for informing practice. Future studies should adhere to recognised standards, conduct model validation and include a broader range of clinical data to derive a prediction model of value for clinicians.

Registration: PROSPERO (CRD42018078418)

Poster 3

Is Poor Asthma Self-Management Due to Failure to Recognise Symptoms or Failure to Act? Novel Insights from Mining Large-Scale Clinical Observational Study

Syed Ahmar Shah

Background: There is a need to better understand how patients self-manage their asthma while using mobile health technology in order to devise one that is clinically effective.

Aim: We aim to improve our understanding of how patients with asthma self-manage their condition while using mobile health system.

Methods: Publicly available dataset collected in large-scale, observational trial with over 6000 participants using an iPhone application (the Asthma Mobile Health Study1) was utilised. All patients with at least 3 months of data were analysed and divided into “Good Self-Managers” and “Poor Self-Managers”. Subsequently, self-management was divided into two distinctive aspects; symptoms, and actions. This resulted in a two-dimensional matrix for quantitative comparison.

Results: There were 58 patients with at least 3 months of data with 30 “Good Self-Managers” and 28 “Poor Self-Managers”. Patients in the latter group were significantly less likely to be symptom-free when they took no actions. Most often, these patients had only a single symptom when they fail to take any action. “Poor Self-Managers” were significantly more likely to take 2 actions when patients had at least two symptoms. Further investigation of data from “Poor Self-Managers” revealed that these patients often only have a single symptom before an adverse event. Applying thresholds on peak flow readings just prior to adverse event lead to best case accuracy of 39%.

Conclusion: Patients miss out on “timely self-management” because they fail to take an action in the presence of a single symptom. This symptom is non-specific. When patients do take multiple actions, they already have multiple symptoms suggesting that they got late in taking appropriate action. Applying thresholds on peak flow readings is not sufficient to provide early warning. Future efforts should focus on algorithms that can warn patients when they experience any symptom.

Funding: The University of Edinburgh Chancellor’s Fellowship Scheme

¹Chan, Yu-Feng Yvonne, et al. “The Asthma Mobile Health Study, a large-scale clinical observational study using ResearchKit.” *Nature biotechnology* 35.4 (2017): 354.

Poster 4

Using information on all previous exacerbations to predict future risk of attack

¹Bonnett LJ, ²Blakey J

¹University of Liverpool; ²Sir Charles Gairdner Hospital, Perth, Australia;

Background: Identifying individuals who are at risk of asthma attack has the potential to improve quality of life, and reduce the possibility of hospital admission. Statistical methods enable predictions regarding which subgroups of people with asthma have a higher risk of an exacerbation than others. Most existing statistical models only include information about events prior to starting treatment; they fail to account for events along a person’s journey.

Aim: To develop a statistical model which provides patients with an estimate of risk of, and ultimately time to, their next asthma attack using information about all exacerbations, rather than just the first after starting treatment.

Methods: Data from the Optimum Patient Care Research Database were modelled using three different approaches – negative binomial regression, zero-inflated negative binomial regression and the multiple time-to-event approach of Prentice, Williams and Peterson.

Results: According to data from the first observation window, modelling count of exacerbations via the negative binomial distribution appears the most appropriate choice based on the model fit statistics shown in Table 1. The smaller the values, the better the model fit.

Table 1: Model Fit Statistics

Model	RMPSE	MAPE	Prediction Bias
Negative Binomial	1.31	1.43	0.01
ZINB	2.33	2.83	0.07
PWP-GT	11.79	41.29	-0.70

Sensitivity analyses using the entire dataset, only those patients with definite asthma, and according to a random split of the data agreed that the negative binomial model was the most appropriate choice.

Conclusions: Dates of events were previously thought to be useful. However, based on these analyses, counts lead to much better model fit. This may be due to the relatively small number of events experienced by people with asthma. Further work is now required to build a statistical model which adjusts for patient characteristics and provides personalised risk predictions via an online calculator.

Funding: This research was funded by a Post-Doctoral Fellowship (PDF-2015-08-044) from the National Institute for Health Research.

Poster 5

Stakeholder perspectives on evaluation of apps supporting asthma management

¹Chris Newby, ¹Anna Dowrick, ¹Nicola Maayan, ¹Sandra Eldridge.

¹Asthma UK Centre for Applied Research, Centre for Primary Care and Public Health, Queen Mary University of London;

Background: Evidence suggests apps could play an important role in the management of asthma. It is less clear how the effectiveness of apps should be evaluated. This study aimed to collect the views of expert stakeholders about the evaluation of apps as part of asthma management.

Aim: To gain stakeholder perspectives on the issues surrounding the evaluation of apps to support asthma management

Methods: This was a mixed method qualitative study. First, a survey was conducted among methodological stakeholders across the UK around general app evaluation. Second, an expert stakeholder workshop was held. Stakeholders gathered for a one-day discussion of the challenges of evaluating digital interventions for asthma. Attendees also completed a pre and post workshop free-text survey. Data were analysed thematically. The thematic analysis and workshop were informed by a scoping review of the literature on methodologies for evaluating apps.

Selected highlights from the last 5 years



2014

-  Asthma UK Centre for Applied Research officially launched at the Scottish Parliament, with initial five years funding
-  A collaborative network of leading asthma researchers from 13 partners across the UK
-  11 PhD studentships start
-  ARRISA-UK (At-Risk Registers Integrated into primary care to Stop Asthma crises in the UK) study launched
-  Launch of Patient and Public Involvement group
-  First Annual Scientific Meeting, Oxford
-  Established world-leading International Advisory Board

2015

-  University of Southampton joins as an affiliate member
-  Steff Lewis promoted to Professor of Medical Statistics, University of Edinburgh
-  Edinburgh International Science Festival
-  SPEAKAsthma, our Children and Young People's PPI group, officially launched
-  Andrew Wilson promoted to Professor of Respiratory Medicine, University of East Anglia
-  Second Annual Scientific Meeting, Manchester
-  Dunbar Science Festival








2016

-  Third Annual Scientific Meeting, Edinburgh
-  Steve Cunningham promoted to Honorary Professor of Paediatric Respiratory Medicine, University of Edinburgh
-  Universities of Oxford and Exeter join as affiliate members
-  Cochrane Review, Vitamin D for the management of asthma, published
-  Midlothian Science Festival 2016
-  BTS/SIGN British Guideline on the Management of Asthma published
-  Hilary Pinnock promoted to Professor of Primary Care and Respiratory Medicine, University of Edinburgh

2017

-  University of Leeds joins as an affiliate member
-  The Lancet Commission on Asthma published
-  Professor Aziz Sheikh awarded the University of Edinburgh Principal's Medal for Exceptional Service
-  Effectiveness of Influenza Vaccines in Asthma published
-  Professor Chris Griffiths publishes opinion piece on air pollution and public health in The Guardian
-  REACH database launched
-  BBC Terrific Scientific event
-  Patient Involvement Fair, Edinburgh

2018

-  Fourth Annual Scientific Meeting, Bristol
-  IMP²ART (IMPLementing IMProved Asthma self-management as RouTine) study launched
-  First two PhD graduations, with 23 students at the centre
-  Study on impact of London's Low Emission Zone covered by the BBC and The Guardian
-  CHILL (Children's Health in London & Luton) study launched
-  Gwyn Davies promoted to Professor of Respiratory Medicine, Swansea University
-  Air Pollution and You event at Our Dynamic Earth

Continued support from Patient and Public Involvement (PPI) and our wider network

Results: Stakeholders presented the challenges of aligning smartphone apps for asthma with the traditional principles of experimental evaluation, such as clinical trials. Characteristics of apps, such as rapidly changing hardware and software and wide variation in user behaviour posed technical challenges in a standard assessment framework such as trials, and stakeholders found it conceptually challenging to isolate the specific role apps play in asthma care. If apps were seen to directly intervene in asthma management then this had implications for their classification as medical devices suggesting that trials still need to be carried out in order to satisfy medical device regulations.

Conclusion: Stakeholders suggested methodological adaptations to address the technical challenges of apps. Further clarity is needed on what apps do as part of asthma management, what type of digital intervention there are, and debate as to what type of evidence is sufficient to safely offer apps to patients.

Poster 6

Validating the accuracy of asthma outcomes in routine UK primary care data

C. J. Chris Newby, Anna Dowrick, Nicola Maayan, Sandra Eldridge.

¹Chris Newby, ²Neil Wright, ¹Thomas Hamborg, ¹Sandra Eldridge, ³Susan Morrow, ⁴Steven Julious, ⁵Francis Appiagyeyi, ³Derek Skinner, ^{5,6,7}Victoria Carter, ^{5,6,7}David Price, ¹Steph Taylor, ³Hilary Pinnock, on behalf of the IMP2ART study group.

¹Asthma UK Centre for Applied Research, Centre for Primary Care and Public Health, Queen Mary University of London;

²Clinical Trial Service Unit & Epidemiological Studies Unit, Nuffield Department of Population Health, University of Oxford;

³Asthma UK Centre for Applied Research, Usher Institute of Population Health Sciences and Informatics, University of Edinburgh;

⁴Medical Statistics Group, School of Health and Related Research, University of Sheffield

⁵Optimum Patient Care, Cambridge,

⁶Observational and Pragmatic Research Institute, Singapore,

⁷Centre of Academic Primary Care, Division of Applied Health Sciences, University of Aberdeen, Aberdeen

Background: Routine clinical data offers the opportunity to observe healthcare outcomes in populations but the measures used are rarely validated against the full medical record which includes free text and correspondence.

Aim: To validate and explore asthma outcomes in electronic health care records compared to the reference standard.

Method: We compared data on unscheduled asthma care and action plan provision over 12-months extracted manually by inspection of the electronic healthcare records (EHR) (the reference standard) with electronically-extracted coded data from the same 500 patients. Combinations of Read codes and prescribing data were tested to derive the most accurate algorithm compared to the reference standard.

Results: Ten practices each provided data on 50 people with asthma of whom 34% had an unscheduled asthma care event in the manually-extracted data. The best performing algorithm gave a sensitivity/specificity of 71% (95%CI 63% to 78%) and 82% (95%CI 77% to 86%) respectively. The intra-cluster correlation was 0.12 (95%CI 0.050 to 0.33).

For action plan provision, the best performing algorithm only achieved a sensitivity of 34% (95%CI 18% to 54%).

Conclusion: Unscheduled care, but not provision of action plans, can be detected with acceptable accuracy in routine data, though the intra-cluster correlation was high. Validating coded data against a reference standard is an important step in designing, analysing and interpreting the findings of clinical initiatives, implementation and real-life studies.

Funding: NIHR Programme Grant

Poster 7*

ELEVATE: evaluation of the impact of Patient and Public Involvement in the Asthma UK Centre for Applied Research.

¹Olivia Fulton, ¹Allison Worth, ¹Tracy Jackson, ^{1,2}Gill Highet

¹University of Edinburgh; ²NHS Lothian

Background: The Asthma UK Centre for Applied Research (AUKCAR), a collaboration of 17 UK universities, aims to improve the lives of people affected by asthma. Patient and Public Involvement (PPI) has been embedded in the Centre's work from the start, with dedicated staff working in partnership with lay volunteers to support researchers to plan and deliver meaningful involvement.

Aim: To evaluate the impact of PPI on AUKCAR research, researchers and lay volunteers.

Methods: The study and study materials were co-designed by staff and lay volunteers. We conducted a documentary analysis of AUKCAR materials, including meeting minutes and support requested from the PPI group. The views of researchers and lay volunteers on their experiences of PPI and its impact on them and their work were gathered through questionnaires and qualitative interviews.

Results: 40 researchers and lay volunteers completed questionnaires and 24 took part in interviews. The impacts of involvement on AUKCAR research included: keeping the patient voice at the front of research; making research more relevant/ applied; improving study methods and information; helping set the research agenda. Researchers and lay volunteers identified profound personal impact from their collaboration, including: increased confidence; better communication skills; increased asthma knowledge; interesting range of opportunities. Facilitators to meaningful involvement were identified as: the qualities and skills of staff and lay volunteers; supportive, nurturing relationships; underpinning values of equality and appreciation. Challenges remain in the geographical dispersion of the partner universities and lay volunteers; inadequate resources; not all researchers embrace PPI. Areas for improvement were identified: more face-to-face contact; more consistent provision of feedback to lay volunteers on the impact of their involvement; online skills training for lay volunteers and researchers.

Conclusions: This co-produced evaluation captured specific impacts, including both examples of best practice in PPI and areas for development.

Poster 8

A Patient-Centred Definition of Severe Asthma: The Patient Understanding Leading to an appropriate Severe Asthma Review (PULSAR) Initiative.

McGuinness A¹, Wilson A²⁻⁴, Fletcher M^{4,5}, Price D⁶⁻⁸, Winders T⁹

¹Patient representative, Asthma UK Centre for Applied Research Patient Participation Involvement Programme, Usher Institute, The University of Edinburgh, Edinburgh, UK;

²University of East Anglia, Norwich, UK;

³Norfolk and Norwich University Hospital, Norwich, UK;

⁴Asthma UK Centre for Applied Research, Usher Institute, The University of Edinburgh, Edinburgh, UK;

⁵Global Respiratory Franchise, GSK, Brentford, Middlesex, UK;

⁶Division of Applied Health Sciences, University of Aberdeen, Aberdeen, UK;

⁷Observational and Pragmatic Research Institute, Singapore, Singapore;

⁸Optimum Patient Care Ltd, Oakington, Cambridge, UK;

⁹Global Allergy and Asthma Patient Platform, Vienna, Austria.

Background: Severe asthma is poorly understood and under recognised by patients and general practitioners (GPs), which may delay patients from receiving the appropriate level of care.

Aim: Patient Understanding Leading to an appropriate Severe Asthma Review (PULSAR) is a novel, patient-led, multidisciplinary initiative aiming to develop and disseminate a global, patient-centred definition of severe asthma. This initiative aims to improve patient understanding of the disease, whereby patients are encouraged to visit their GP to discuss their asthma symptoms and consider a referral, if appropriate.

Methods: Asthma guidelines, web-based patient organisation information and medication information were searched to identify current severe asthma definitions and terminology available to patients and healthcare

professionals. This background research was used by a multidisciplinary working group to help draft a patient-centred definition of severe asthma. The working group consisted of two patients with severe asthma, four patient advocacy group members, two nursing specialists, one primary care physician, three respiratory specialists and one clinical scientist.

Results: Patient organisation websites mostly define severe asthma using symptoms, whereas asthma guidelines base their definitions on treatment failure or symptoms experienced by patients despite receiving high-intensity therapy. Medication information did not specifically define severe asthma. Common terminology and concepts (treatments, symptoms, activity levels and emotions) used to define severe asthma were agreed within the working group and a definition of severe asthma was drafted.

Conclusions: A novel patient-centred definition of severe asthma has been drafted to improve patient understanding of the condition. This may encourage patients to visit their GP, which may increase specialist referrals and prompt optimal management strategies in severe asthma. The definition will be reviewed by a behavioural scientist, to optimise the language used, and surveyed by patients with severe asthma to produce a final definition for a consensus publication.

Funding: GlaxoSmithKline, Global Allergy and Asthma Patient Platform

Poster 9*

The effects of anonymisation on the accuracy and generalisability of observational studies: A case study in asthma.

Mehrdad A Mizani, Aziz Sheikh

¹ Asthma UK Centre for Applied Research, The University of Edinburgh

Background: Access to individual-level data is important for accurate and generalisable observational studies. Data holders provide individual-level data usually in safe-havens, after applying anonymisation methods. The most common methods are variations of k-anonymity, query control, synthetic datasets, Statistical Disclosure Control (SDC), and differential privacy. These methods delete, change, swap, or summarise data elements, thereby potentially reducing the usefulness and precision of the dataset. Researchers who receive anonymised data are not always informed about the characteristics of manipulation applied to the dataset. These uncertainties regarding data precision can lead to undetected bias in observational studies based on statistical and Machine Learning (ML) methods.

Aim: We aim to develop ML tools to measure and characterise the utility of anonymised asthma data as well as non-disclosive characteristics of anonymisation methods. This utility measurement will be used to understand the implication of anonymisation and the induced bias. Further, it provides the grounds for cross-disciplinary analysis of the effects of anonymisation on the interpretation of observational studies and their generalisability in asthma research. It can also be helpful in guiding anonymisation procedures suitable for observational studies.

Proposed methods: Clustering validity indices will be used to measure the overall numerical utility of anonymised datasets. SDC and differential privacy will be used to report non-disclosive characteristics of anonymisation methods.

Points for discussion: We seek to stimulate discussion on approaches currently used in asthma research to maintain data anonymity and to consider the potential impact of these on analytic considerations; opportunities for working with colleagues to investigate this empirically; development of novel approaches to maintain data granularity whilst at the same time preserving anonymity.

Funding: Mehrdad A. Mizani's Newton International Fellowship is funded by the Academy of Medical Sciences and the Newton Fund.

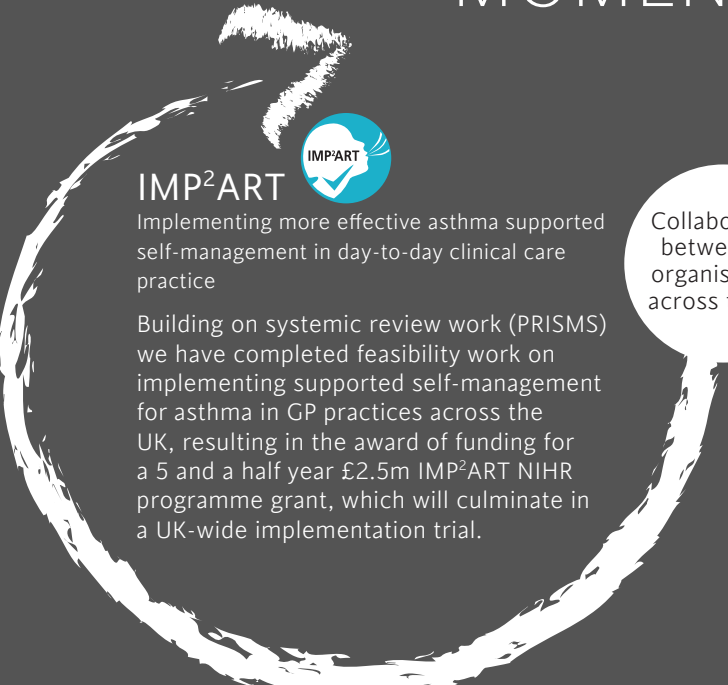



ARRISA-UK 

Reducing the risk of hospital admission by targeting the most high-risk patients for asthma attacks

Established the £2m ARRISA-UK NIHR HTA funded cluster RCT, testing the impact of a web-based education programme linked to risk registers for asthma patients.

Collaboration between 8 universities



IMP²ART 

Implementing more effective asthma supported self-management in day-to-day clinical care practice

Building on systemic review work (PRISMS) we have completed feasibility work on implementing supported self-management for asthma in GP practices across the UK, resulting in the award of funding for a 5 and a half year £2.5m IMP²ART NIHR programme grant, which will culminate in a UK-wide implementation trial.

Collaboration between 10 organisations across the UK

Poster 10*

Cluster analysis to identify asthma subtypes: a critical view of methodological considerations.

¹Elsie Horne, ²Chris Griffiths, ¹Aziz Sheikh, ¹Thanasis Tsanas

¹University of Edinburgh; ²Queen Mary University London

Background: Asthma is increasingly recognised as an umbrella term used to describe a group of distinct diseases leading to similar symptoms. Numerous groupings of asthma have been suggested (e.g. early-onset atopic, severe) but at present none fully account for the heterogeneity observed across asthma patients. The first study to define subtypes of asthma by applying cluster analysis was published by Halder et al. (2008). Many groups have since applied cluster analysis with similar aims. However, carrying out a robust cluster analysis can be challenging when dealing with heterogeneous clinical data.

Aim: To review and critically assess the methodological validity of clustering methods used to identify clinical subtypes of asthma.

Methods: A PubMed search was carried out to identify studies which applied cluster analysis to heterogeneous clinical datasets to identify asthma subtypes. Studies focusing on genetic or cytokine profiling, and those which exclusively used imaging and mobile app data were excluded. Details of clustering methodologies were extracted from all studies. In cases where the methodology was unclear, authors were contacted for clarification. Clinical findings were summarised and compared across studies. Based on the methodological findings, recommendations will be made for future researchers intending to carry out cluster analyses to identify clinical subtypes of asthma.

Interim results (or Progress made): Forty-six studies have been identified and data are currently being extracted.

On-going challenges (or Points for discussion): Although data extraction is not complete, three limitations have been identified in many of the studies: 1) samples sizes are very small for meaningful, robust cluster analysis; 2) methods suitable only for continuous data are being applied to mixed data; 3) the stability and validity of the cluster solutions are not adequately tested.

Trial registration: NA

Funding: Medical Research Council (MRC)

Poster 11*

Development and Feasibility Testing of a Scalable Intervention to Promote Physical Activity Among Sedentary Adults with Moderate or Severe Asthma.

¹Tyson L, ¹Wilson A, ¹Jones A, ¹Hardeman W, ²Stratton G, ²Davies G

¹University of East Anglia ²Swansea University

Background: Regular physical activity is considered an important component in the overall management of asthma. However, studies found that patients with asthma are less physically active compared to people without the condition, possibly due to fear of triggering symptoms. Behaviour change interventions that promote physical activity have potential to reduce asthma attacks and the burden of asthma on healthcare services and patients. Recently, there has been a greater focus on using mobile devices (mHealth) to help transform how asthma care is delivered. This technology has the potential to deliver just-in-time adaptive interventions, to provide behaviour change support to patients in a scalable cost-effective way.

Aim: Develop and test the feasibility of a scalable behaviour change intervention to promote physical activity among sedentary adults with moderate/severe asthma.

Proposed Methods: A literature review is underway to examine the effects of physical activity interventions on behavioural and health outcomes, and to identify different intervention components currently being used. Qualitative research and stakeholder consultations will also be undertaken to inform intervention content and delivery. It is envisaged that the intervention will comprise of behaviour change support, individual exercise prescriptions and delivered by a mHealth component. The piloting and feasibility testing of the intervention will use qualitative and quantitative methods to assess feasibility, acceptability and implementation. Outcomes will include exercise capacity, asthma symptoms and attack frequency. Focus groups and/or semi-structured interviews will be conducted to explore the findings and aid the development of a definitive trial.

Points for Discussion: The development and piloting of a complex intervention according to Medical Research Council guidelines that, following evaluation, can be used to increase physical activity in people with asthma. The use of behaviour change techniques via digital mHealth components.

Funding: Asthma UK Centre for Applied Research and University of East Anglia Faculty of Medicine and Health Sciences.

Poster 12*

Current recommendations/practices for anonymising data from clinical trials in order to make it available for sharing: A scoping review

¹Rodriguez A, ¹Tuck C, ²Dozier MF, ¹Lewis SC, ³Eldridge S, ¹Weir CJ

¹Edinburgh Clinical Trials Unit, Usher Institute of Population Health Sciences and Informatics, the University of Edinburgh

²Library & University Collections, Information Services, the University of Edinburgh

³Pragmatic Clinical Trials Unit, Blizard Institute, Barts and the London School of Medicine and Dentistry, Queen Mary University of London

Background: There are increasing pressures for anonymised datasets from clinical trials to be shared across the scientific community. There are various sets of recommendations on how to perform anonymisation prior to sharing clinical trial data.

Aim: We aim to systematically identify, describe and synthesise these recommendations.

Methods: We will systematically search literature databases and websites of key organisations in the field. Any publication reporting recommendations on anonymisation to enable data sharing in clinical trials will be included. Two reviewers will independently screen titles, abstracts and full text for eligibility. One reviewer will extract data from included papers which will then be sense checked by a second reviewer. Results will be summarised by narrative review. This scoping review will provide information about existing recommendations for anonymising clinical trial datasets in order to make them available for sharing and it will inform (if applicable) the development of new recommendations.

Interim results: We just have the protocol finalised on the 11JAN2019 and I (Aryelly Rodriguez- AR) hope to present preliminary results on the meeting to be held on the 12MARCH2019 in London

On-going challenges: There might be potential issues in the coding of the themes arising from the relevant literature

Conclusions: Currently there is a strong demand for academic researchers to share their research data more readily. In clinical trials, data can be shared more widely if they are anonymised, yet we do not have standardised recommendations on how to do this. To the best of our knowledge, this will be the first systematic review of these emerging recommendations/techniques. We will gather and describe all the identified recommendations and we will provide a map for future research regarding anonymisation of datasets in clinical trials to enable data sharing

Funding: AR has a scholarship from the University of Edinburgh to undertake a PhD with the support from the Asthma UK Centre for Applied Research (AUKCAR).

Poster 13

Investigating the national context for supported self-management to inform the IMP²ART implementation strategy

¹Renukanthan A, ¹Sheringham J, ²Pinnock H, ²Morrow S, ²McClatchey K, ³Taylor S, for the IMP²ART programme group.

Asthma UK Centre for Applied Research, ¹University College London; ²The University of Edinburgh, ³Queen Mary University of London

Background: The IMP²ART study is developing an implementation strategy to embed supported self-management into routine asthma care. Implementation strategies need to align with the context in which practices are working. This project aimed to provide a baseline of the national context at the start of IMP²ART.

Methods: A search for guidance documents (2008-2018) was undertaken, supplemented with documents recommended by the IMP²ART team on supported self-management in long-term conditions (LTCs) and primary care contractual arrangements. A descriptive comparative review was conducted on retrieved documents. Informal discussions with respiratory leaders from the Primary Care Respiratory Society (PCRS) provided insights into the documents' influence on self-management in practice.

Results: Eight documents guiding supported self-management in asthma or LTCs and the GP contract were reviewed. All national/international documents on asthma (three guidelines; National Review of Asthma Deaths (NRAD)), recommended supported self-management, though there were differences in emphasis and priority attached to different aspects of supported self-management (action plans, shared decision-making). Implementation strategies were covered in detail in generic guidance on supported self-management in LTCs but with little specific to asthma. Supported self-management is currently not incentivised in the Quality and Outcomes Framework.

13 PCRS leaders most commonly referred to BTS/SIGN as their core guideline for supported self-management of asthma though highlighted the stark influence of NRAD. Time constraints and feeling de-skilled constrained self-management practice but education and technology supported it.

Conclusion: There is consensus about a pivotal role for supported self-management in asthma amongst all documents reviewed. To enhance the effectiveness of local implementation strategies, IMP²ART may consider developing an "implementation resource" to consolidate existing guidance.

Funding: IMP²ART is funded by NIHR PGfAR (RP-PG-1016-20008) with preliminary work supported by Asthma UK (AC-2012-01). The views expressed are those of the authors, not necessarily those of the NHS, NIHR or Department of Health

Poster 14*

IMpLeMenting IMProved Asthma self-management as Routine Treatment: the IMP²ART programme.

¹McClatchey K, ¹Morrow S, ²Taylor S, ¹Pinnock H for the IMP²ART programme group.

Asthma UK Centre for Applied Research, ¹The University of Edinburgh, ²Queen Mary University of London.

Background: Supported self-management, which helps people adjust their treatment in response to changes in symptoms, improves day-to-day control and reduces the risk of asthma attacks. However, supported self-management is not widely implemented; fewer than a quarter of people replying to a recent Asthma UK web-survey owned an action plan. Successful implementation of supported self-management requires attention to patient resources, professional motivation and training, and prioritisation and support from the organisation.

Aims: The IMP²ART programme aims to develop an implementation strategy that will improve the implementation of supported self-management in routine clinical practice.

Methods: Building on preliminary findings, and working with six general practices, Asthma UK, PCRS-UK and Education for Health, we will develop components of an implementation strategy:

1. Patient resources to support self-management (e.g. a range of action plans; flexible access to professional advice; digital options)
2. Professional education to motivate and train practice teams (e.g. online, team-based modules to raise awareness and provide specific skills)
3. Organisational strategies to facilitate adoption (e.g. audit/feedback; review templates; electronic action plans)

Progress Made: Each of the three components are under development by the IMP²ART programme team, with input from patient and public involvement (PPI), and a professional advisory group. Feedback on the developed components will be sought using qualitative interviews, and staff and patients from six practices are being recruited as participants.

Points for Discussion: Feedback generated from the interviews will be incorporated into the components, which will then be pre-piloted in four practices to assess feasibility. Following a pilot trial, the implementation strategy will be evaluated in the IMP²ART UK-wide trial cluster-RCT (n=144 practices). This will evaluate the impact and cost-effectiveness of the IMP²ART implementation strategy on unscheduled care (assessed from routine data) and ownership of action plans. A mixed-methods process evaluation will explore potential for scaling-up and sustainability.

Funding: IMP²ART is funded by NIHR PGfAR (RP-PG-1016-20008) with preliminary work supported by Asthma UK (AC-2012-01). The views expressed are those of the authors, not necessarily those of the NHS, NIHR or Department of Health

Poster 15*

Learning Health Systems: Translating current approaches into a chronic disease management framework.

¹Sengupta M, ²Sheikh A, ³Simpson C

¹ University of Edinburgh, UK; ² University of Edinburgh, UK; ³ University of Wellington, NZ.

Background: The American healthcare system consists of costly, inefficient and unsafe care. Spiralling health care costs, latency between best practice knowledge and actual application in practice, inefficient public health infrastructure, and other factors make the Learning Health System (LHS) an important need. There is an urgent need for continuous and rapid learning from various patient and clinical experiences to advance better quality care and improve as a by-product of every interaction; to protect and improve the health of individuals, communities and populations. It aims to be an integrated ecosystem of scientific progress, informatics, and care culture, generating knowledge from the care experience; delivering best practices for continuous improvement in healthcare.

Aim: Systematically search relevant theoretical, empirical literature to document a comprehensive review of existing studies and work done in Learning Health Systems. To identify gaps in current knowledge and thinking and to recommend areas for future research. Identify potential learnings, key lessons emerging from the management of acute diseases that can be translated and applied to the management of chronic diseases, especially asthma. To develop a Learning Health System framework that can be applied to the management of chronic disease. To identify learnings from the US Learning Health System movement and identify lessons applicable to the United Kingdom healthcare context.

Methods: The scoping review protocol as developed by Arksey and O'Malley.

Progress made: Currently developing and executing a scoping review protocol that surveys the healthcare landscape and the work done on various aspects of the LHS, inclusive of knowledge management, infrastructure, trust and validation.

Points for discussion: The scale of an LHS requires consideration of multiple social, technical and environmental variables. How does one prioritise and choose?

Funding: College of Medicine and Veterinary Medicine PhD (eHERC/Farr Institute) Studentship.

Investigating the Burden of Asthma coMorbidity (IBAM): a retrospective cohort study.

Karim El Ferkh,¹ Bright I. Nwaru^{1,2}, Chris Weir¹, Chris Griffiths,³ Aziz Sheikh A.¹

¹Asthma UK Centre for Applied Research, Centre for Medical Informatics, Usher Institute for Population Health Sciences, The University of Edinburgh

²School of Health Sciences, University of Tampere, Finland

³Asthma UK Centre for Applied Research, Centre for Primary Care and Public Health, Blizard Institute, Queen Mary, University of London

Background Asthma is a common long-term disorder with a number of related co-morbid conditions, which may impact asthma outcomes. In the UK, it is largely unknown how these conditions affect the patient and the healthcare.

Aim:

- To provide reliable estimates of annual period prevalence of asthma comorbidity, and describe how these vary by age, sex, socioeconomic status, and geography.
- To provide reliable estimates of the healthcare utilisation associated with each asthma comorbidity including GP consultations, prescriptions, attendances at A&E services, ambulance services, outpatient consultation, and inpatient care.

Methods: A national longitudinal retrospective observational study between 2009 and 2018 using The Secure Anonymised Information Linkage (SAIL) Databank. We will calculate the number of patients who reported/ were diagnosed to have asthma with one or at the end of the 5 years (95% confidence intervals will be presented for prevalence rates). The prevalence and healthcare utilisation estimates will be multiplied by 1000 to give estimates per 1000 of the population. We will also compare the number of non-asthma consultations between asthma patients and non-asthma patients, between 2009 and 2018, in terms of GP visits, accident and emergency attendance, and prescriptions.

Progress made: We have our database ready and we are starting to extract the data needed to start cleaning and analysing. Study protocol has been developed and registered. The study is expected to be completed by April 2019.

On-going challenges: Working out the cost of each event (GP visit, prescriptions, hospital admission etc..) across all patients.

Funding: This work is supported by the Chief Scientist's Office of the Scottish Government and Asthma UK as part of the Asthma UK Centre for Applied Research [AUK-AC-2012-01].

BN is supported by the Farr Institute and Asthma UK Centre for Applied Research.

Please note that posters 17-23 are the same as oral presentations 01-07. See pages 5 to 9 for full details.

