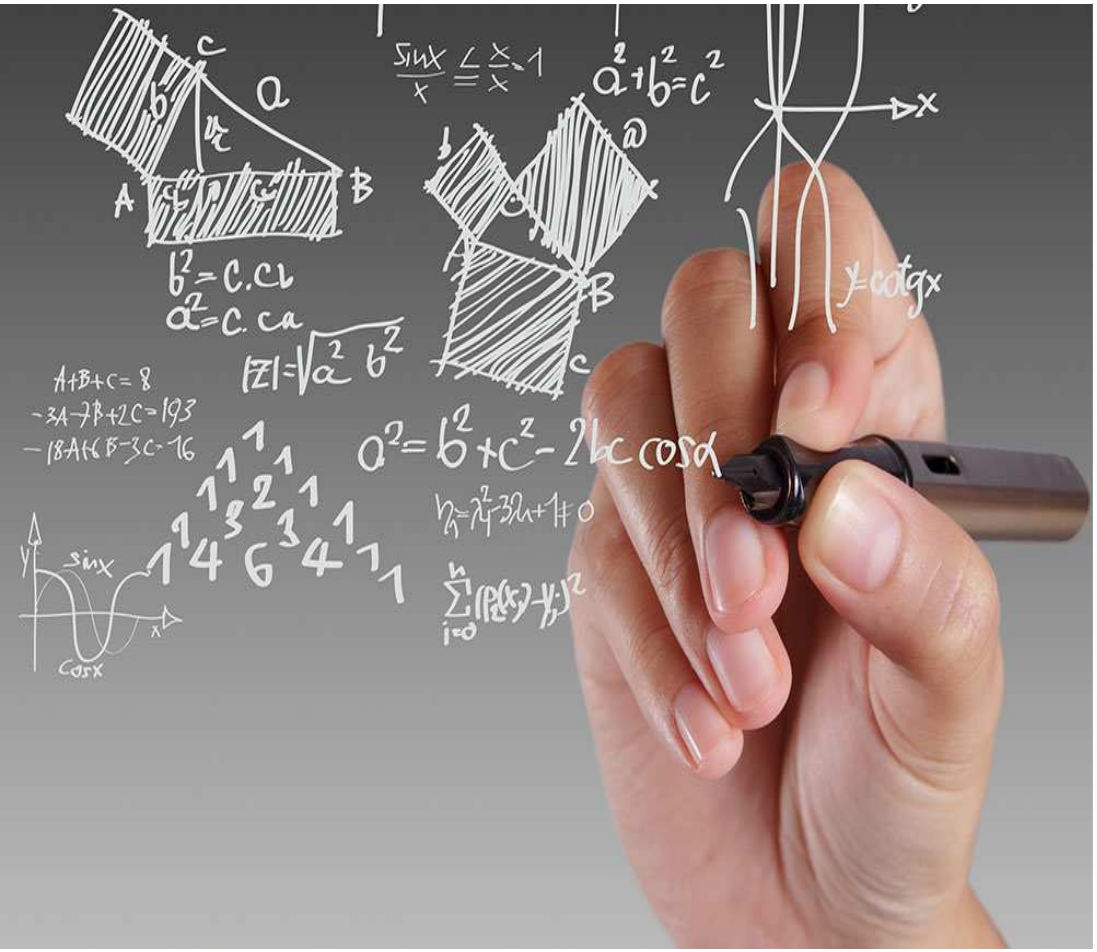
BRIT2
Optimising Prescribing

Anti-microbial resistance: Informing or telling primary care clinicians what to do? Knowledge Support System to provide information during consultation

Prof. Tjeerd van Staa tjeerd.vanstaa@manchester.ac.uk

MANCHESTER 1824 The University of Manchester
HDRUK Health Data Research UK
Public Health England
NIHR
King's College London

Telling clinicians what to do?
Give GPs an algorithm??



ClinRisk

Welcome to the QRISK®3-2018 risk calculator https://qrisk.org

This calculator is only valid if you do not already have a diagnosis of coronary heart disease (including angina or heart attack) or stroke/transient ischaemic attack.

Reset | Information | Publications | About | Copyright | Contact Us | Algorithm | Software | UKC

About you

Age (25-84): 64

Sex: Male Female

Ethnicity: White or not stated

UK postcode: leave blank if unknown

Postcode:

Clinical information

Smoking status: non-smoker

Diabetes status: none

Angina or heart attack in a 1st degree relative < 60?

Chronic kidney disease (stage 3, 4 or 5)?

Welcome to the QRISK®3 risk calculator

This site calculates a person's risk of developing a heart attack or stroke over the next 10 years, produci score described in this academic paper:

- Development and validation of QRISK3 risk prediction algorithms to estimate future risk of cardiovascular disease: prospective cohort study. BMJ 2017;357:j2099

It presents the average risk of people with the same risk factors as those entered for that person.

The algorithm has been developed by doctors and academics working in the UK National Health Service based on routinely collected data from many thousands of GPs across the country who have freely conti data to the QResearch database for medical research.

It has been developed for the UK population, and is intended for use in the UK. All medical decisions ne be taken by a patient in consultation with their doctor. The authors and the sponsors accept no responsil for clinical use or misuse of this score.

The uncertainty with using risk predicti models for individual decision making: exemplar cohort study examining the prediction of cardiovascular disease in English primary care

Alexander Pate[1*], Richard Emsley[2], Darren M. Ashcroft[3,4], Benjamin Brown[4,5] and Tjeerd

QRISK2 + adjusting for additional risk factors, a secular trend, geographical variation in risk and the method for imputing missing data when generating a risk score (**model A–model F)**.

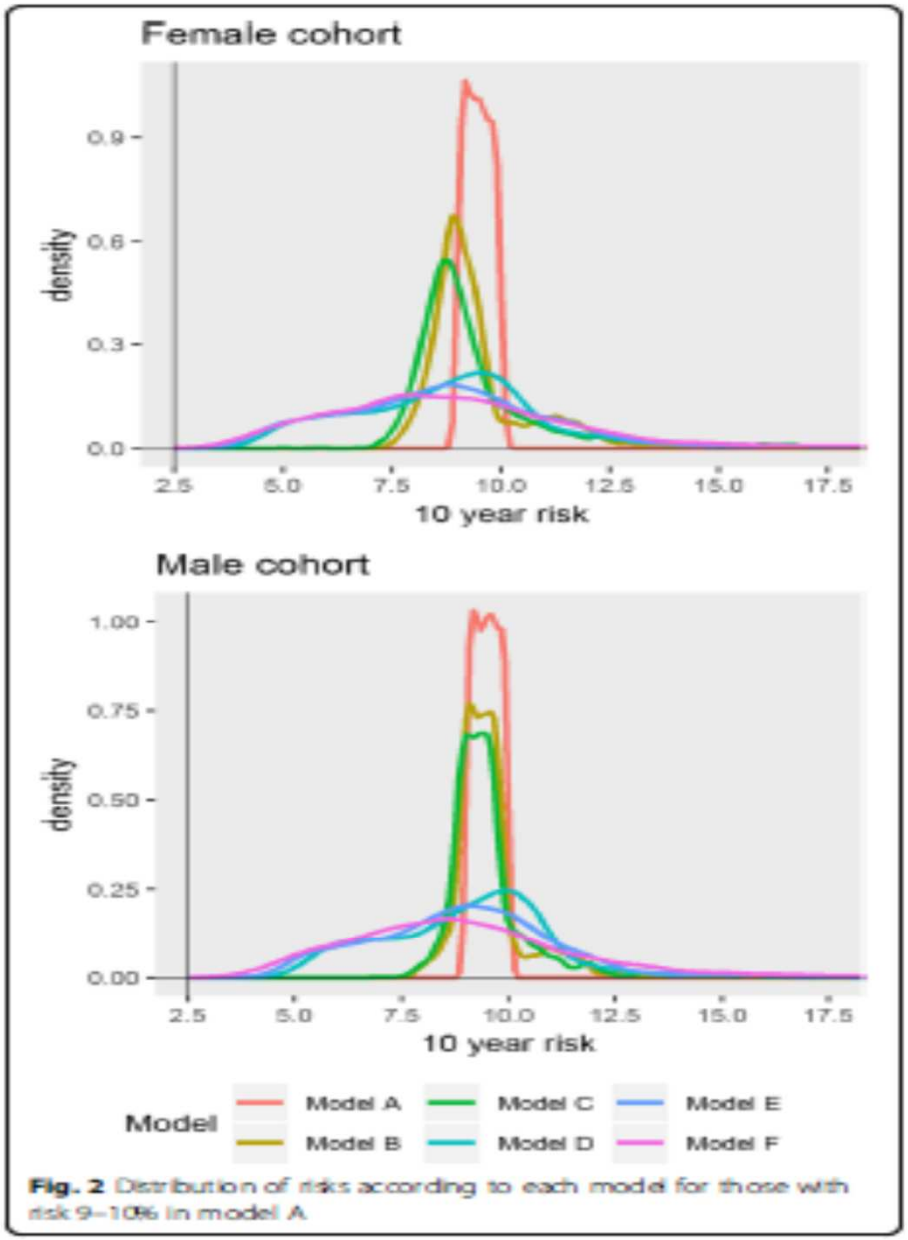


Fig. 2 Distribution of risks according to each model for those with risk 9–10% in model A

Examining the impact of data quality and completeness of electronic health records on predictions of patients' risks of cardiovascular disease

Yan Li[a], Matthew Sperrin[a], Glen P. Martin[a], Darren M. Ashcroft[b,c], Tjeerd Pieter van Staa[a,d,e,*]

"The considerable unmeasured heterogeneity in CVD incidence between practices was not explained by variations in data quality or effects of risk factors. QRISK3 risk prediction should be supplemented with clinical judgement and evidence of additional risk factors."

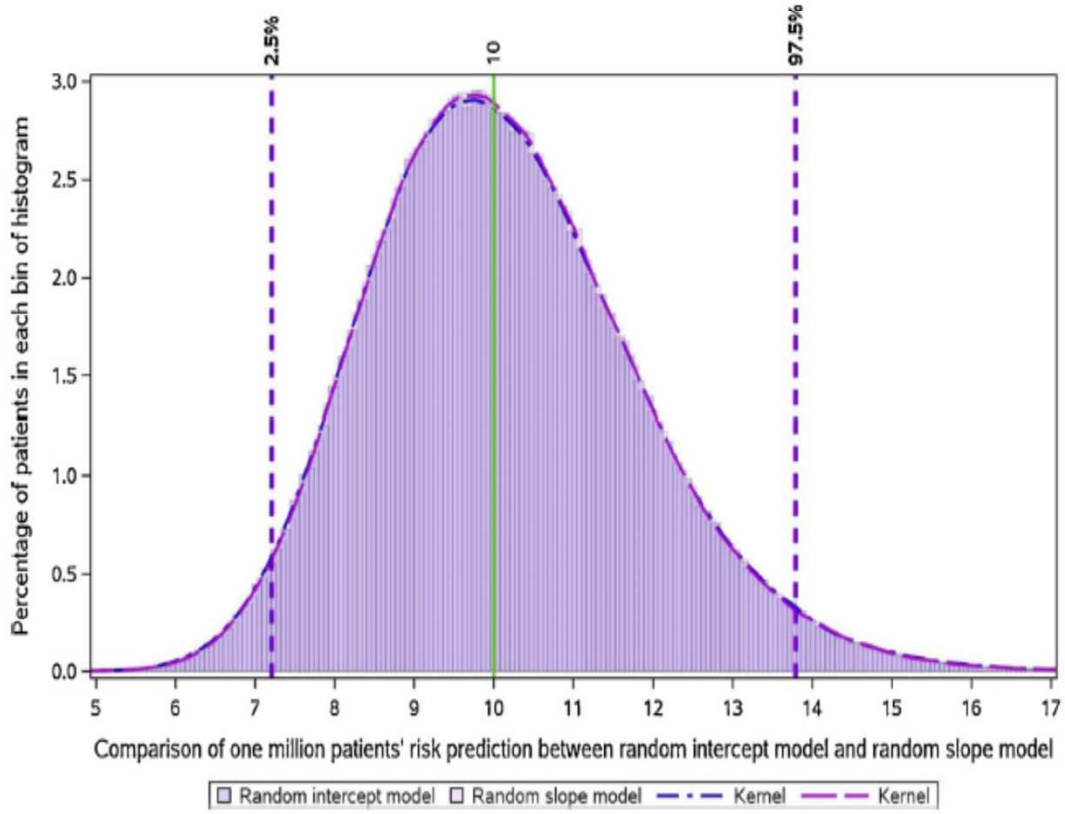
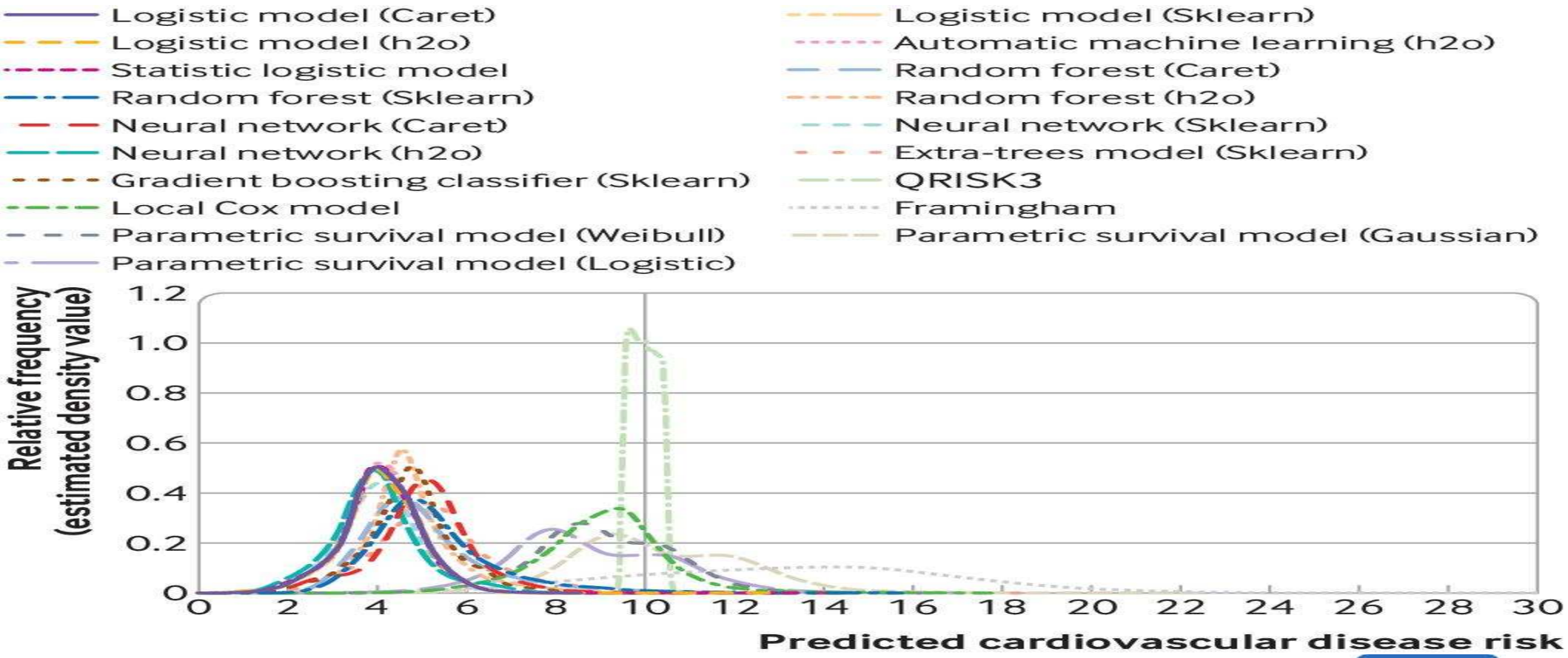


Fig. 4. Comparison of the CVD risk predictions between the random intercept and slope models for patients with a QRISK3 risk of 10 % (in a patients with 50 % males and 50 % females).

Artificial intelligence: hype or real?

Distribution of individual risk predictions with machine learning and statistical models in overall cohort for patients with predicted cardiovascular disease risks of 9.5-10.5% in QRISK3 (Cox model)

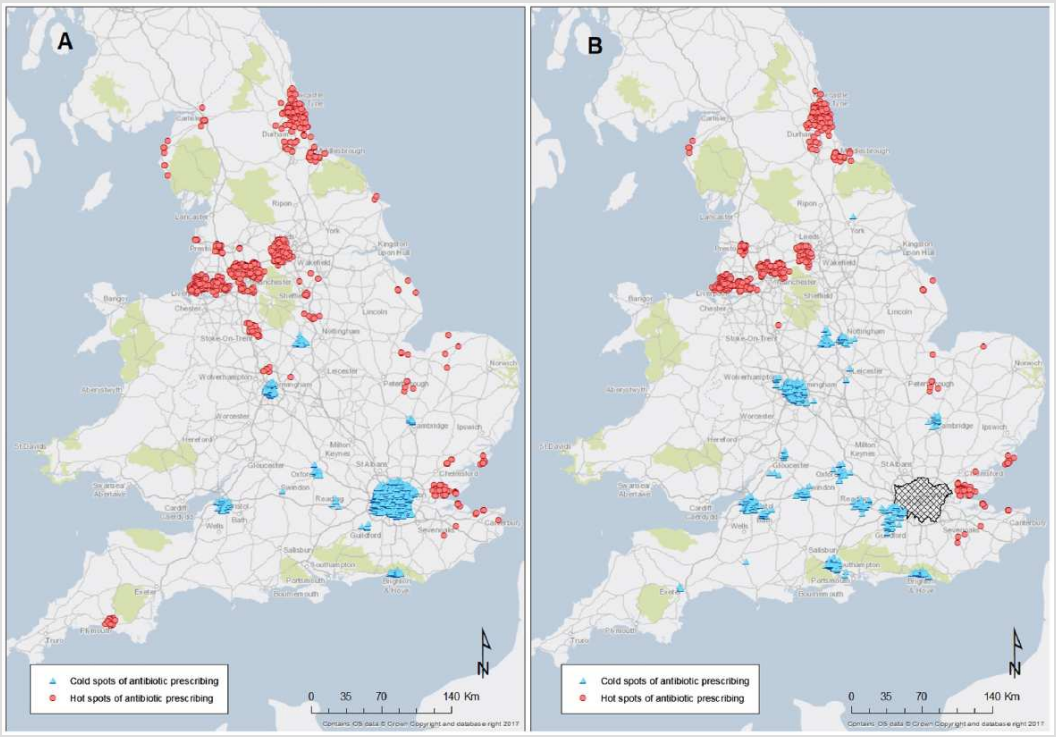


Yan Li et al. BMJ 2020;371:bmj.m3919

thebmj

ANTIBIOTIC OVERPRESCRIBING IS CLUSTERED IN THE NORTH OF ENGLAND

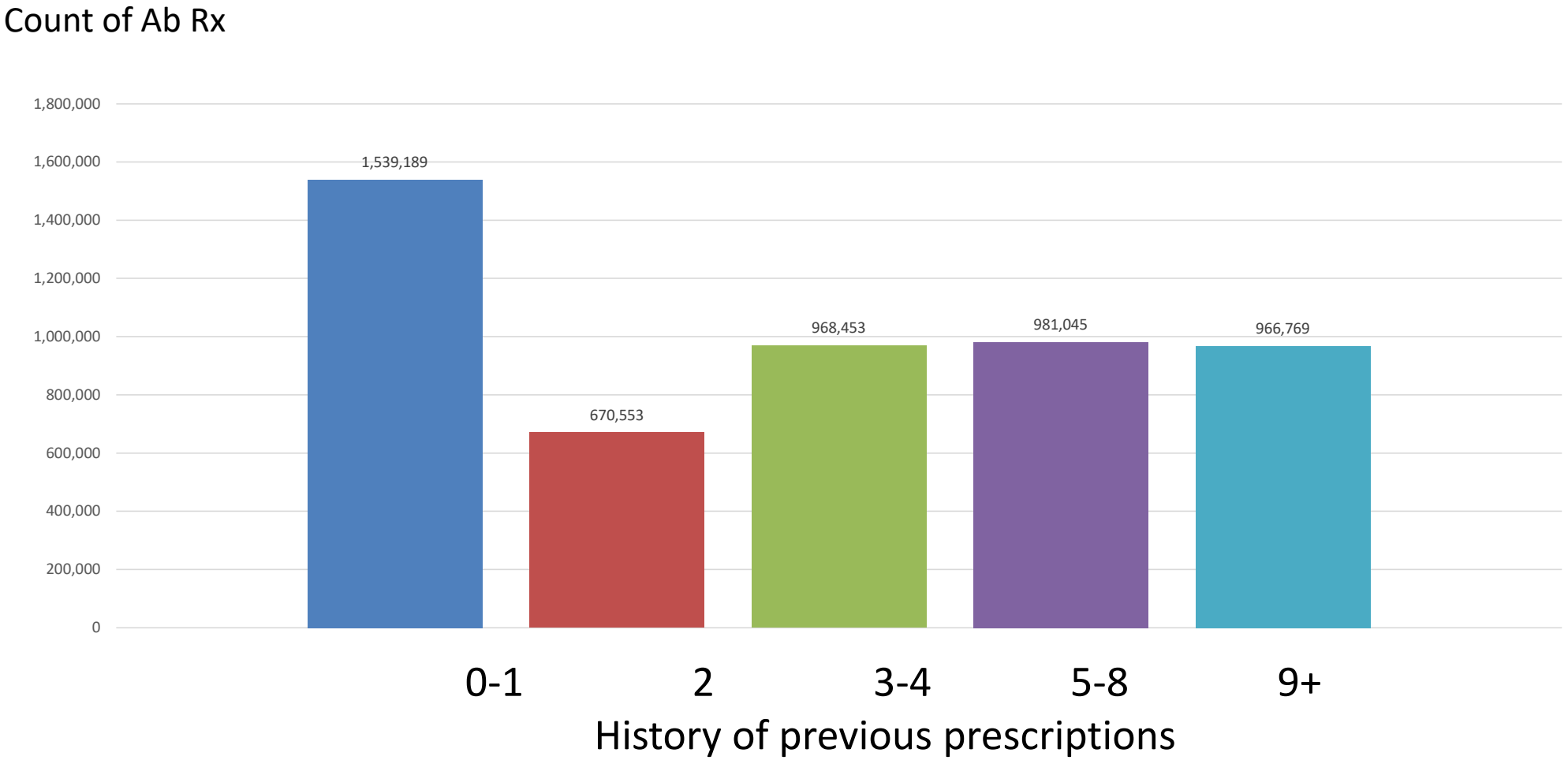
Data source for analysis: NHS Digital.



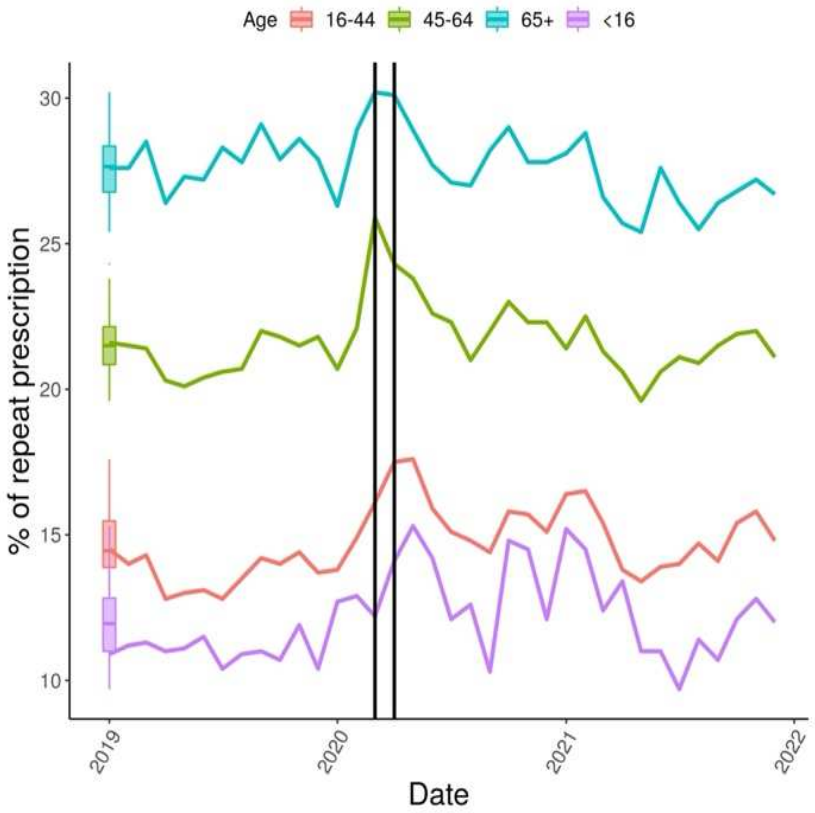
Hot and cold spots of antibiotic prescribing in English GP practices in 2016.
A: All GP practices. B: Excluding GP practices located in the London CCGs.

Antibiotic prescribing patterns in general medical practices in England: Does area matter? Anna Mölter et al (2018).
DOI: 10.1016/j.healthplace.2018.07.004

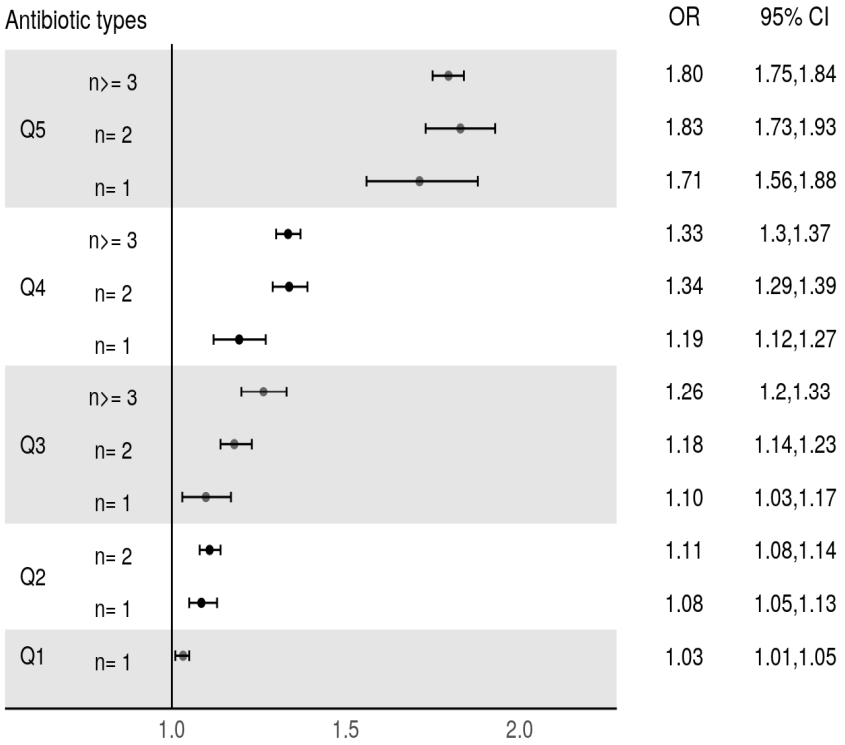
Frequent antibiotic prescribing very frequent (in 3 years before)



Repeat antibiotic prescribing



The impact of COVID-19 on antibiotic prescribing in primary care in England: Evaluation and risk prediction of appropriateness of type and repeat prescribing



OR by N prior antibiotics and N types

Repeated antibiotic exposure and risk of hospitalisation and death following COVID-19 infection (OpenSAFELY): a matched case–control study

Repeat antibiotic prescribing

The Impact of Oral Antibiotics Prior to Cancer Diagnosis on Overall Patient Survival: Findings from an English Population-Based Cohort Study

Eleni Domzaridou [1,*], Tjeerd Van Staa [2,3], Andrew G. Renehan [4], Natalie Cook [5,6], William Welfare [7], Darren M. Ashcroft [1,8] and Victoria Palin [2,9]

		Cancer Registry	
Cancer Type	Exposure Group	Crude HR [95% CI]	Adjusted HR [95% CI]
Leukaemia	Recent	1.34 [1.17–1.52]	1.32 [1.16–1.51]
	Previous	1.12 [0.98–1.26]	1.11 [0.98–1.26]
	Past	reference	reference
Lymphoma	Recent	1.26 [1.12–1.41]	1.22 [1.08–1.36]
	Previous	1.13 [1.01–1.26]	1.09 [0.97–1.22]
	Past	reference	reference
Myeloma	Recent	1.22 [1.05–1.43]	1.19 [1.04–1.36]
	Previous	1.07 [0.93–1.24]	1.09 [0.96–1.23]

ORs of emergency hospital admission for antimicrobial resistance or Clostridium Difficile infection

	case	control	CDI or AMR (ICD-10) adjusted[3] ORs (95% CI)
No AB exposure	4332	47137	Reference
count 1, type 1	2396	16988	1.37 (1.29-1.46)
count 2-3, type 1	670	3818	1.67 (1.51-1.86)
count 2-3, type 2-3	1154	5904	1.73 (1.59-1.89)
count 4+, type 1	476	2316	1.64 (1.45-1.87)
count 4+, type 2-3	3633	12160	2.42 (2.27-2.57)
count 4+, type 4+	2789	4377	4.76 (4.43-5.12)
			CDI or AMR testing (SNOMED)
No AB exposure	6640	78642	Reference
count 1, type 1	3821	27125	1.44 (1.37-1.52)
count 2-3, type 1	1068	5875	1.86 (1.71-2.02)
count 2-3, type 2-3	1780	9072	1.90 (1.78-2.03)
count 4+, type 1	762	3336	2.21 (2.01-2.44)
count 4+, type 2-3	5900	17717	3.09 (2.95-3.24)
count 4+, type 4+	4731	6445	6.25 (5.91-6.62)

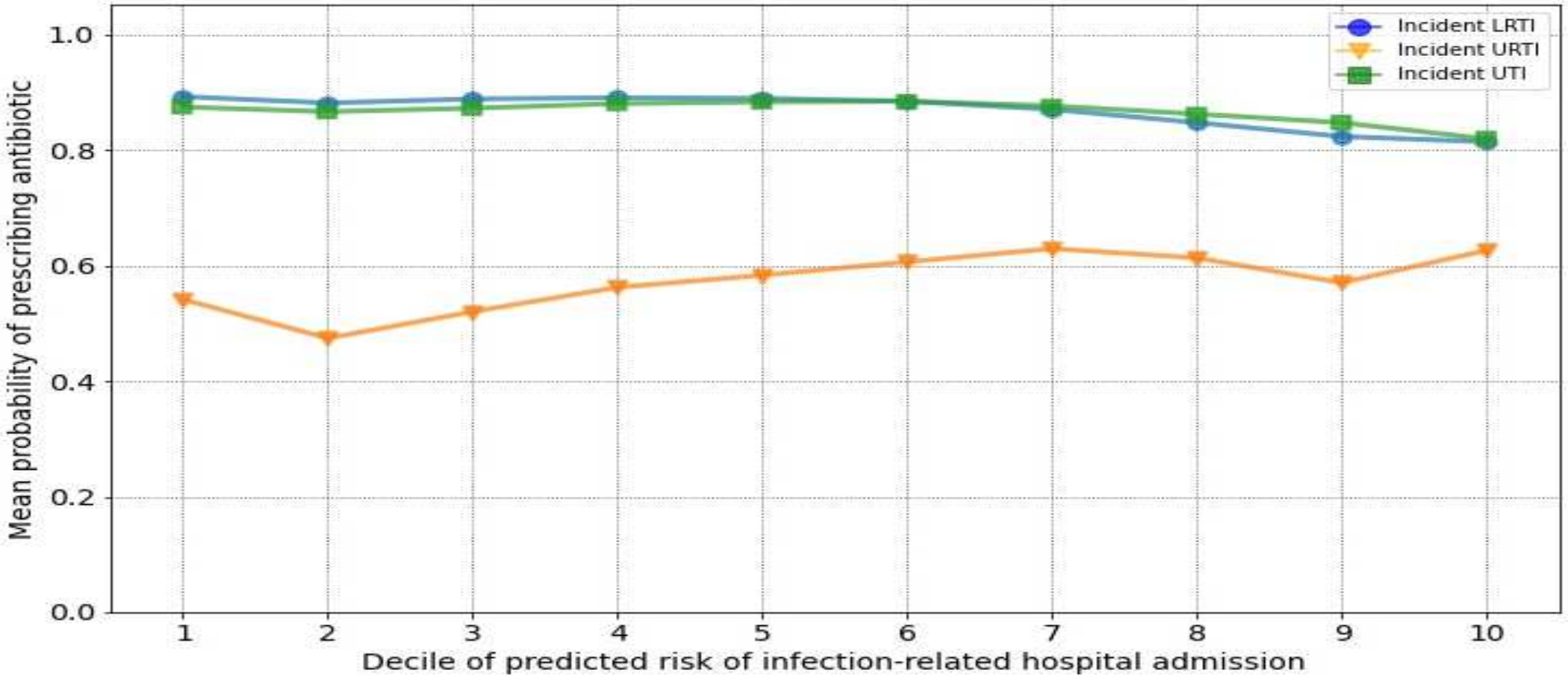
Risk-based prescribing of antibiotics

OpenSAFELY

Deciles[1] of predicted risk	LRTI N cases (Rate)	URTI N cases (Rate)	UTI N cases (Rate)
Decile 1 (lowest)	1,030 (4.3)	1,465 (2.0)	945 (3.6)
Decile 2	2,100 (8.7)	4,545 (6.1)	1,845 (7.0)
Decile 3	2,650 (11.0)	5,665 (7.6)	2,440 (9.3)
Decile 4	3,020 (12.5)	6,300 (8.5)	2,820 (10.8)
Decile 5	3,725 (15.5)	7,155 (9.6)	3,605 (13.7)
Decile 6	4,690 (19.5)	8,350 (11.2)	5,090 (19.4)
Decile 7	6,225 (25.8)	9,735 (13.1)	7,490 (28.5)
Decile 8	9,065 (37.6)	13,600 (18.3)	11,280 (43.0)
Decile 9	13,185 (54.7)	21,940 (29.5)	15,740 (60.0)
Decile 10 (highest)	17,995 (74.7)	38,270 (51.4)	23,435 (89.3)

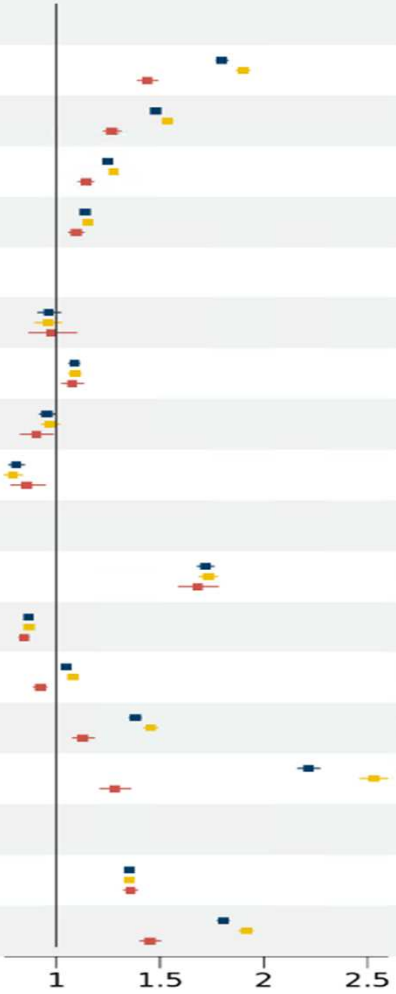
Risk-based prescribing of antibiotics

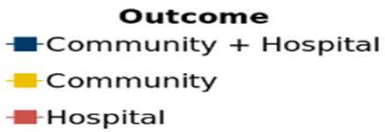
OpenSAFELY



Clinical and health inequality risk factors for non-COVID-related sepsis during the global COVID-19 pandemic: a national case-control and cohort study

type	OR (95% CI)	OR2 (95% CI)	OR3 (95% CI)
IMD			
IMD 1(Most deprived)	1.80 (1.77 to 1.83)	1.90 (1.87 to 1.93)	1.44 (1.39 to 1.49)
IMD 2	1.48 (1.46 to 1.50)	1.54 (1.51 to 1.56)	1.27 (1.23 to 1.31)
IMD 3	1.25 (1.23 to 1.27)	1.28 (1.26 to 1.30)	1.14 (1.11 to 1.18)
IMD 4	1.14 (1.12 to 1.16)	1.15 (1.13 to 1.17)	1.10 (1.06 to 1.13)
Ethnicity			
Mixed	0.96 (0.91 to 1.02)	0.96 (0.90 to 1.02)	0.98 (0.87 to 1.10)
South Asian	1.09 (1.06 to 1.11)	1.09 (1.06 to 1.12)	1.08 (1.03 to 1.13)
Black	0.96 (0.92 to 1.00)	0.97 (0.93 to 1.02)	0.90 (0.83 to 0.99)
Other	0.81 (0.77 to 0.85)	0.79 (0.75 to 0.84)	0.86 (0.78 to 0.95)
BMI			
Underweight (<18.5 kg/m2)	1.72 (1.68 to 1.76)	1.73 (1.69 to 1.78)	1.68 (1.59 to 1.78)
Overweight (25-29.9 kg/m2)	0.87 (0.86 to 0.88)	0.87 (0.86 to 0.88)	0.85 (0.82 to 0.87)
Obese I (30-34.9 kg/m2)	1.05 (1.03 to 1.06)	1.08 (1.06 to 1.10)	0.92 (0.89 to 0.95)
Obese II (35-39.9 kg/m2)	1.38 (1.35 to 1.41)	1.45 (1.42 to 1.49)	1.13 (1.08 to 1.18)
Obese III (40+ kg/m2)	2.22 (2.16 to 2.27)	2.53 (2.47 to 2.60)	1.28 (1.21 to 1.36)
Smoking			
Former	1.35 (1.34 to 1.37)	1.35 (1.34 to 1.37)	1.36 (1.33 to 1.39)
Current	1.80 (1.78 to 1.83)	1.91 (1.88 to 1.95)	1.45 (1.41 to 1.50)





User design workshops BMC Health Serv 2022

Personalised risk scores

- Infection complicatio...
- Resistant bacteria
- Adverse outcomes
- AB failure

Patient summary

- Previous AB use
- Relevant comorbidities

Antibiotic Knowledge Support

Personalised guidelines

Automatic EHR cording

- EMIS/Snomed coded symptoms and scores

Patient communication

- Patient leaflet
- Discussion prompts

NICE and computable guidelines (common infections)

- Plan for KSS to include *personalised* guideline information (i.e., present information relevant for patient)

- BUT: NICE treatment guidelines not computable
  - Core concepts not well defined and incomplete (e.g. high risk)
  - NICE as collaborator: can not present selected parts of guideline

- BUT: Frequent clinical challenges not addressed in guidelines
  - About 20-25% prescribed an antibiotic get repeat one
  - Repeated antibiotic frequent

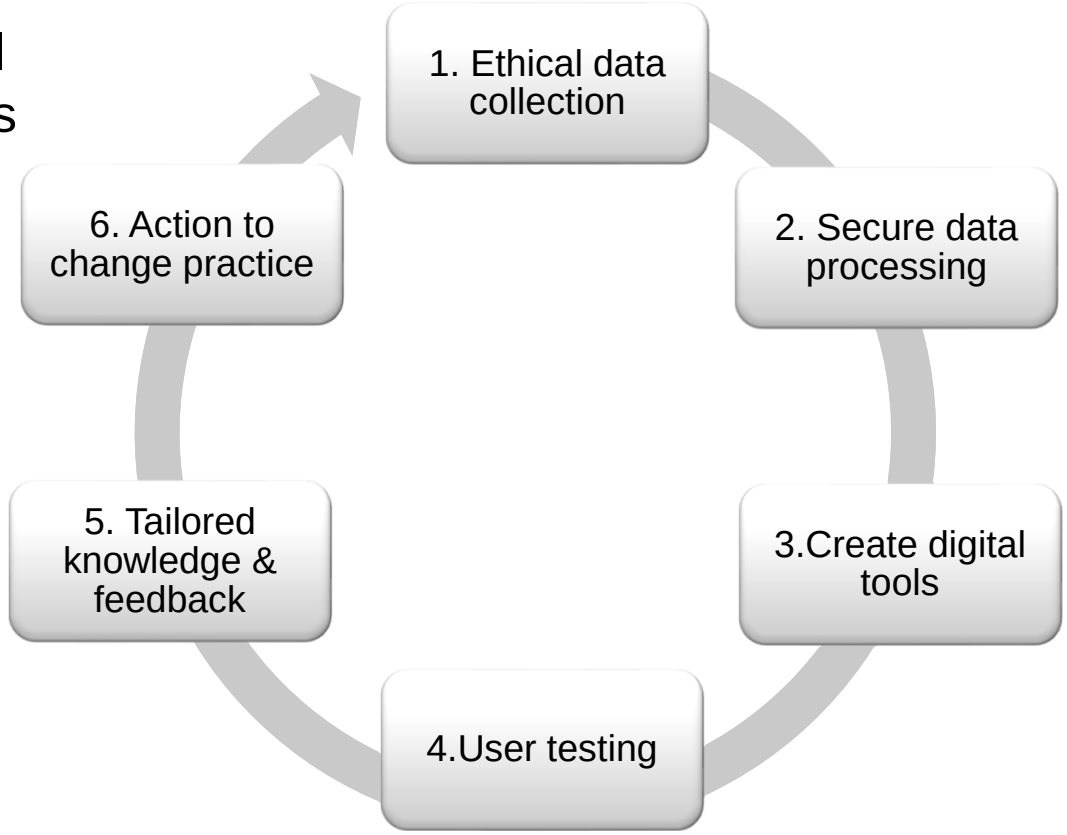
Building Rapid Interventions to improve antibiotic prescribing

Aim: to implement digital and analytical tools to support clinicians and patients in management of common infections in primary care

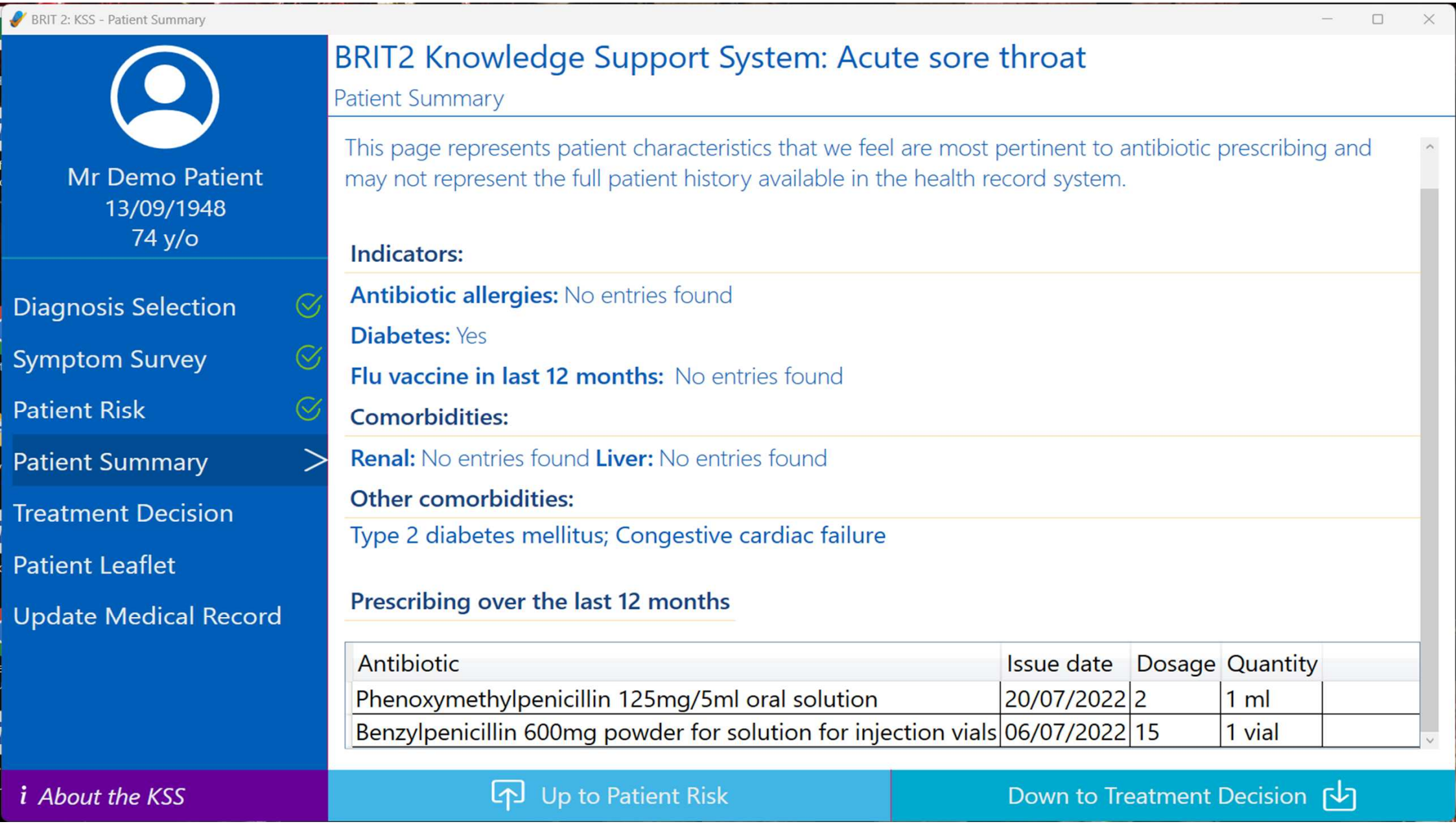
Approaches

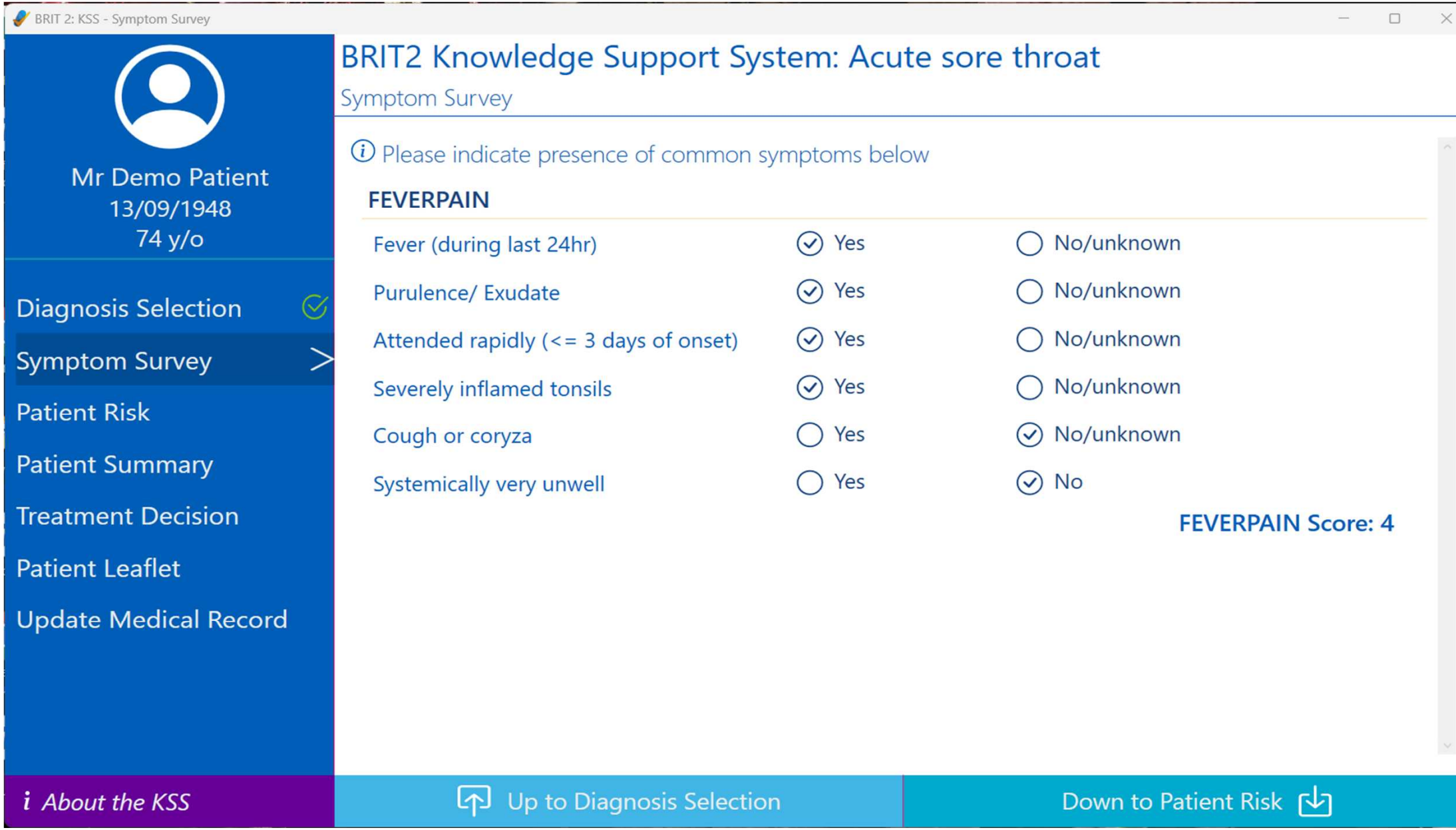
1. Advanced data analytics using large national datasets combined with participating practices (> 10 million records)
2. Dashboard feedback to general practices
3. Knowledge Support System during consultation (integrated with EMIS)

⇒Effectiveness evaluation in ongoing cluster randomised trial



SUPPORTED BY
NIHR | National Institute for Health and Care Research


BRIT 2: KSS - Patient Summary
Mr Demo Patient
13/09/1948
74 y/o
Diagnosis Selection
Symptom Survey
Patient Risk
Patient Summary
Treatment Decision
Patient Leaflet
Update Medical Record
i About the KSS
BRIT2 Knowledge Support System: Acute sore throat
Patient Summary
This page represents patient characteristics that we feel are most pertinent to antibiotic prescribing and may not represent the full patient history available in the health record system.
Indicators:
Antibiotic allergies: No entries found
Diabetes: Yes
Flu vaccine in last 12 months: No entries found
Comorbidities:
Renal: No entries found Liver: No entries found
Other comorbidities:
Type 2 diabetes mellitus; Congestive cardiac failure
Prescribing over the last 12 months
Antibiotic
Issue date
Dosage
Quantity
Phenoxymethylpenicillin 125mg/5ml oral solution
20/07/2022
2
1 ml
Benzylpenicillin 600mg powder for solution for injection vials
06/07/2022
15
1 vial
Up to Patient Risk
Down to Treatment Decision


BRIT 2: KSS - Symptom Survey
Mr Demo Patient
13/09/1948
74 y/o
Diagnosis Selection
Symptom Survey
Patient Risk
Patient Summary
Treatment Decision
Patient Leaflet
Update Medical Record
BRIT2 Knowledge Support System: Acute sore throat
Symptom Survey
Please indicate presence of common symptoms below
FEVERPAIN
Fever (during last 24hr) Yes No/unknown
Purulence/ Exudate Yes No/unknown
Attended rapidly (<= 3 days of onset) Yes No/unknown
Severely inflamed tonsils Yes No/unknown
Cough or coryza Yes No/unknown
Systemically very unwell Yes No
FEVERPAIN Score: 4
About the KSS
Up to Diagnosis Selection
Down to Patient Risk

BRIT 2: KSS - Patient Risk

Mr Demo Patient
13/09/1948
74 y/o

- Diagnosis Selection
- Symptom Survey
- Patient Risk
- Patient Summary
- Treatment Decision
- Patient Leaflet
- Update Medical Record

BRIT2 Knowledge Support System: Acute sore throat

Patient Risk

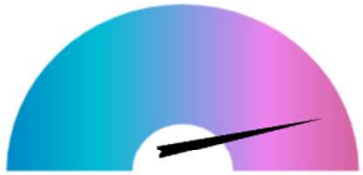
Risk of hospitalisation

4.7%

The patient's risk of hospital admission for infection-related complications such as pneumonia if patient is not prescribed an antibiotic today.
The risk represents the number of admissions per 100 similar patients in the next 30 days.

Main contributing factors to risk score: CCI score, Patient sex, Flu vaccine status

Risk of repeat antibiotic prescribing



25.3%

This is defined as the prescribing of another course of antibiotics in the next 30 days if the patient would get an antibiotic today. i.e., the number of repeat courses per 100 similar patients in the next 30 days.

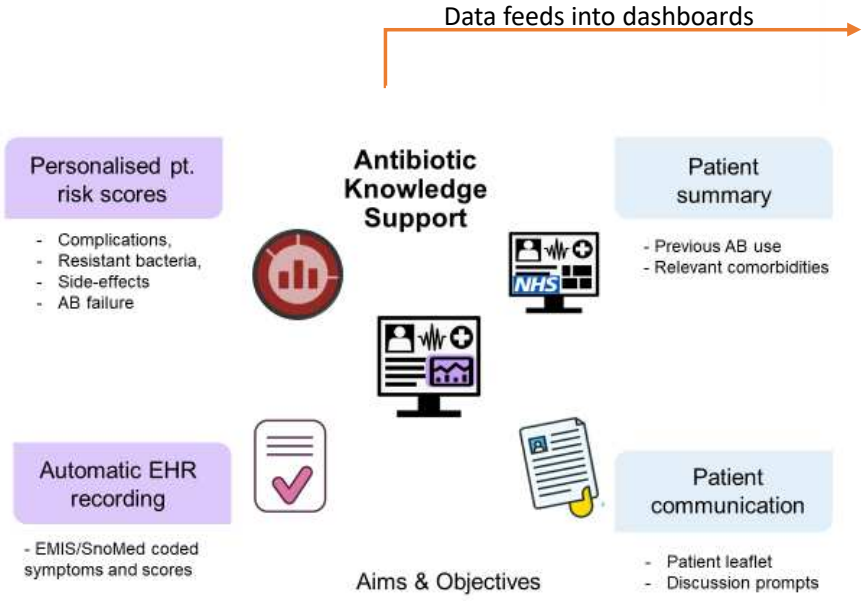
Risk of adverse events

i About the KSS

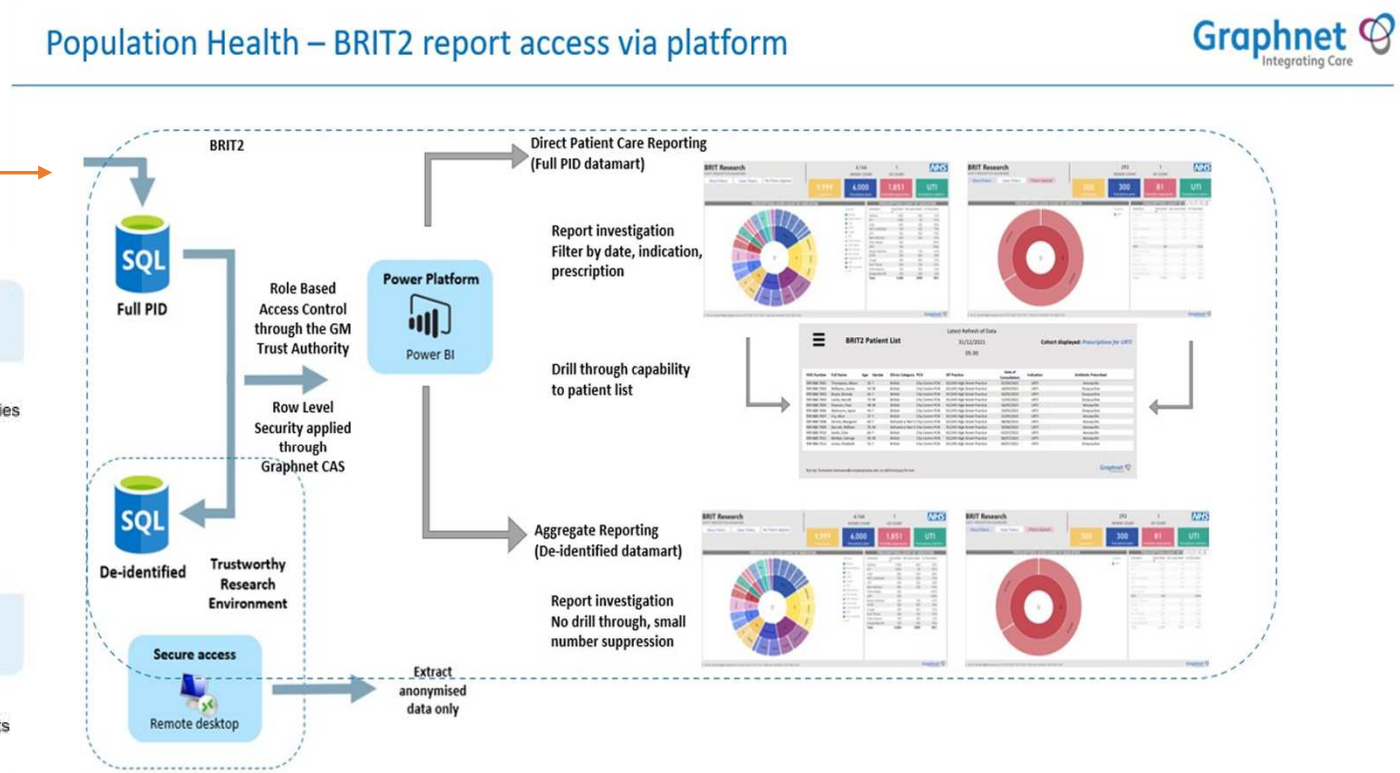
Up to Symptom Survey

Down to Patient Summary

BRIT2 research study – data and GP dashboards

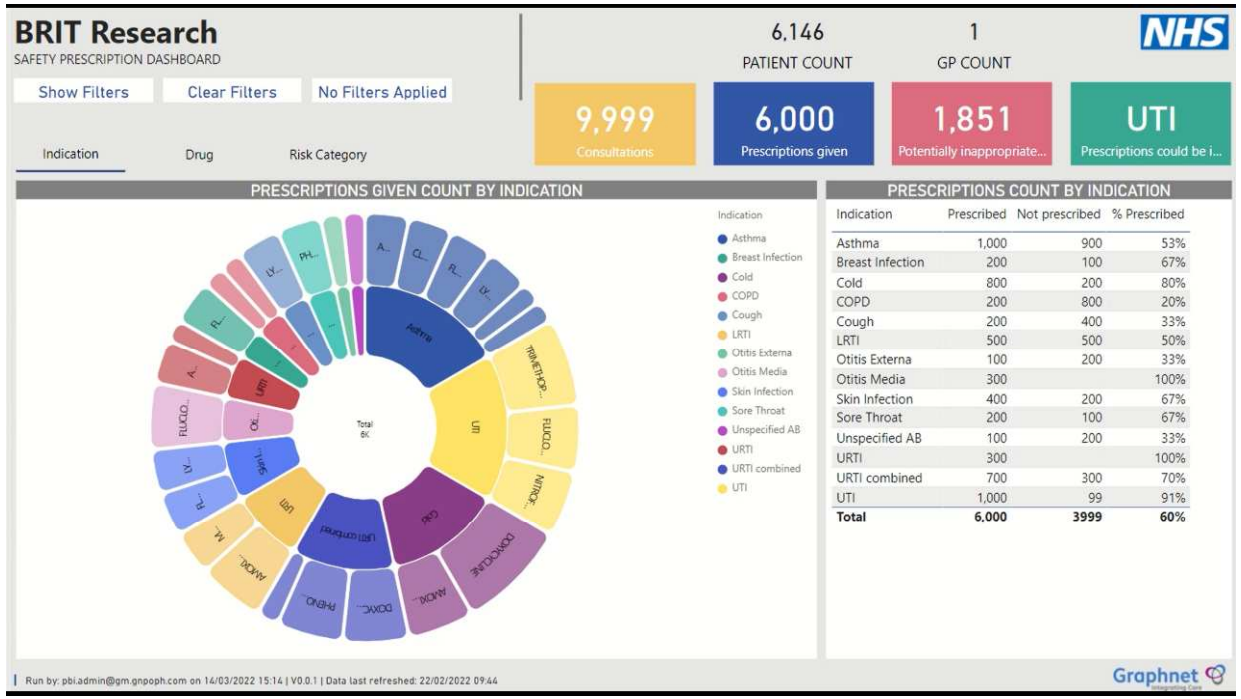


Knowledge support system



Antibiotic prescribing dashboards

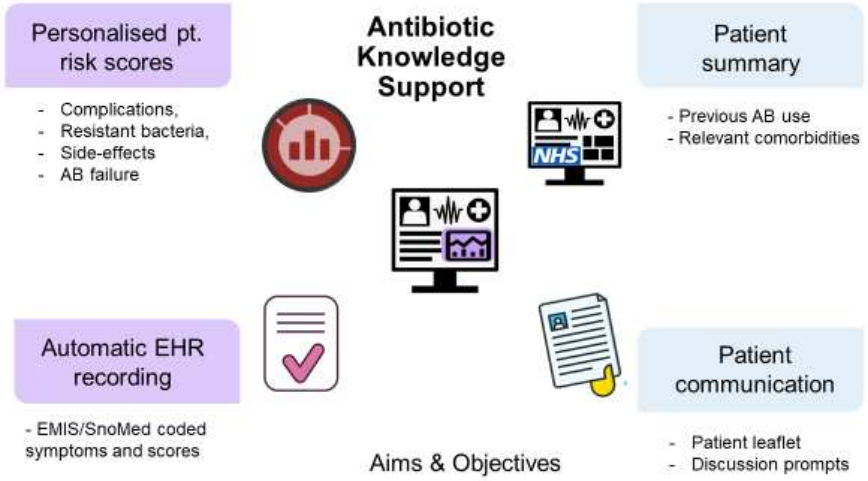
Antibiotic prescribing dashboards

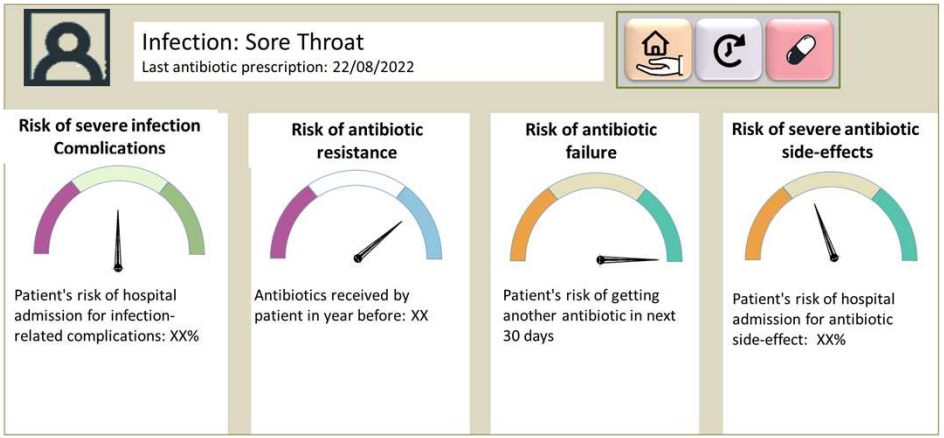


Notes: depends on quality of SNOMED coding

- Analytics by University of Manchester
- Designed by UoM and Graphnet Health Ltd using Microsoft PowerBI.
- Access requests through ICB to <u>any</u> practices in Greater Manchester, Cheshire and Merseyside
- Patient level – patients identifiable to Practice only
- Phase 1:all practice antibiotic prescribing by indication and medication (not EPACT2 data)
- Phase 2: benchmarking, time series, repeat prescribing, risk based prescribing – user feedback changes
- Live dashboards, daily updates.

Knowledge support software





- Designed by GPs and patients (acceptability)
- Developed by University of Manchester (expertise)
- Approved by EMIS (quality standards) / clinical risk assessment
- Installed into practice computers by IT service provider (security)
- Activated by practice manager (control)
- To be used at the point of consultation with patients (decision by user)
- Feedback used to update dashboards (responsive research team)

Practice recruitment

- Research study recruitment - GP practices across Greater Manchester, Cheshire and Merseyside
- EPR – EMIS (TPP SystmOne in development)
- Easy, paid research opportunity up to £1860
- No patient recruitment, no need for training or special expertise
- Require 124 GP practices across Greater Manchester and Cheshire and Mersey (currently 96, - looking for more in Merseyside and Cheshire)
- 124 with access to dashboards and 62 get KSS (48 in KSS arm now)
- Data collection over 12 months (using EHRs)
- Analysis will include use of dashboards and KSS, Effectiveness of interventions and health economics

To take part in this study contact francine.jury@manchester.ac.uk

Challenges and opportunities

Opportunity	Challenges
• Health care record managed by data centre • Anonymised data access for practices signed up to study. • TRE with secure access to authorised personnel • Collaborative approach to problem solving	• Access to data needed committee approval even though NHS ethics approval already in place • DSA / DPIA had to be ICB driven not through research process • Slow processes, lots of cogs in the machine
• Over 1000 GP practices in area to recruit 124 • Support from clinical research network • Payment by local areas to reduce AB prescribing • Enthusiastic support from GP partners	• Capacity for practices to get involved in research • CRN - research active practices (bias) • Communicating to practices – lack of wide reach co-ordinated communication channels
• NHS England / NHS digital support; Move to introduce better digital tools to improve prescribing	• Slow project management incorporated into usual business operations • Timeline for change management not suited to research timelines
• Support from Local IT service providers to install KSS	

Article Text

Article info

Citation Tools

Share

General practice / Family practice

Protocol

Knowledge support for optimising antibiotic prescribing for common infections in general practices: evaluation of the effectiveness of periodic feedback, decision support during consultations and peer comparisons in a cluster randomised trial (BRIT2) – study protocol

Tjeerd van Staa [1], Anita Sharma [2], Victoria Palin [3], Ali Fahmi [1], Harriet Cant [1], Xiaomin Zhong [1], Francine Jury [1], Natalie Gold [4], William Welfare [5], Darren Ashcroft [6], Jung Yin Tsang [7], Rachel Ann Elliott [8], Christopher Sutton [9], Chris Armitage [10], Philip Couch [1], Georgina Moulton [1], Edward Tempest [1], Iain Edward Buchan [11]

Correspondence to Professor Tjeerd van Staa; tjeerd.vanstaa@manchester.ac.uk

PDF

PDF + Supplementary Material