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Eliminating inappropriate antibiotic use

Building a data-driven rapid diagnostic

Department of Primary Care, University of Oxford
23/02/2016

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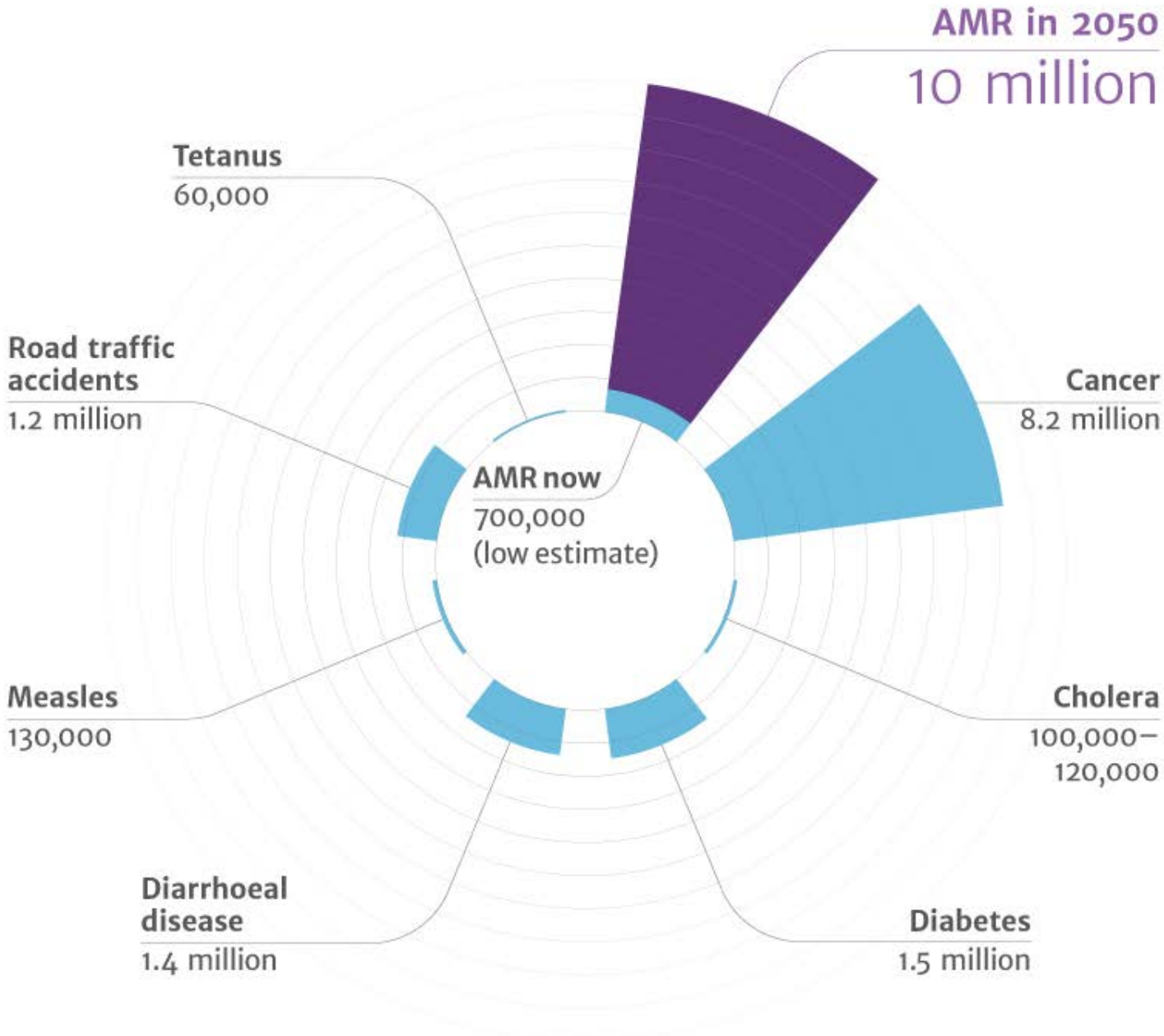

AMR in 2050
10 million
Tetanus
60,000
Road traffic accidents
1.2 million
AMR now
700,000
(low estimate)
Cancer
8.2 million
Measles
130,000
Cholera
100,000–120,000
Diarrhoeal disease
1.4 million
Diabetes
1.5 million

Antimicrobials are rapidly becoming less effective.

To tackle AMR, we need to…

Reduce demand for antimicrobials

Inappropriate use of antibiotics is high – up to 67%

Prescribing as in 1950s

Needs to be done safely

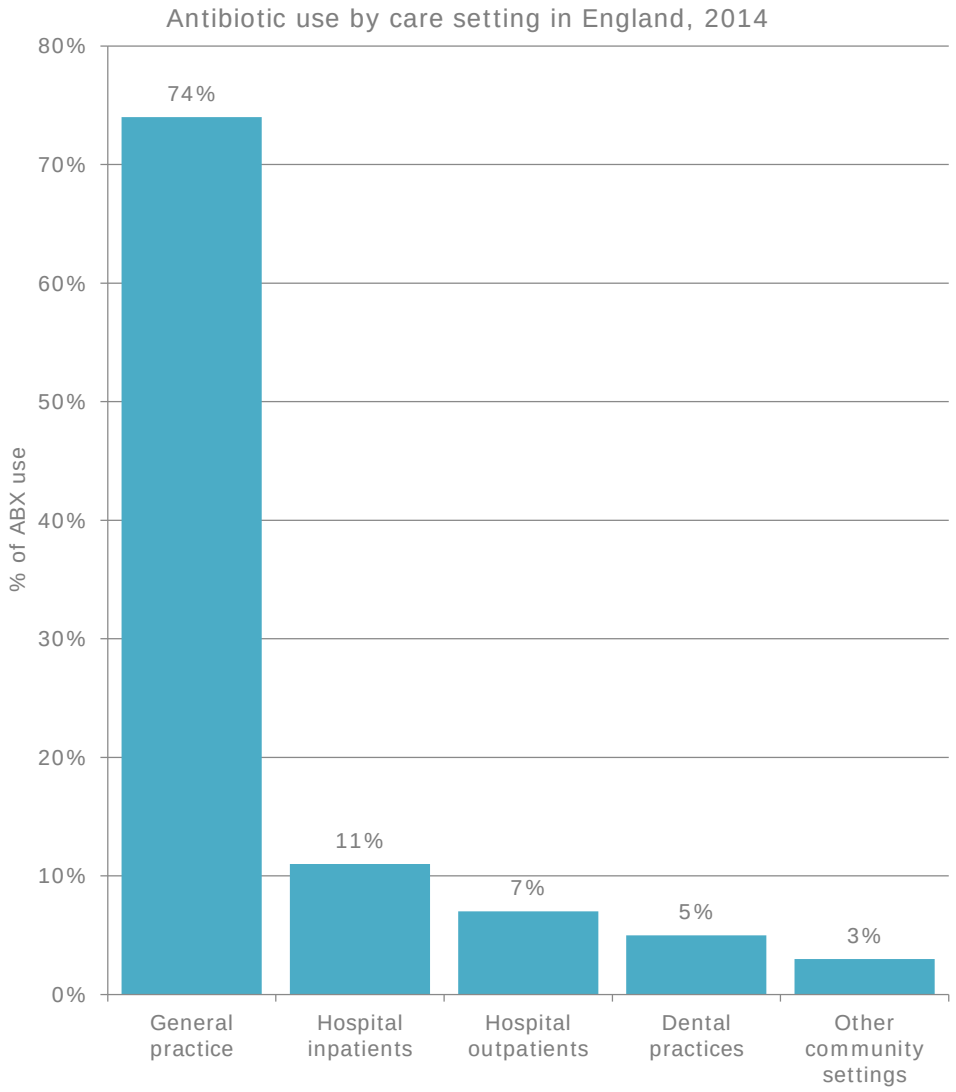
Increase supply of new antimicrobials

No new class for 30 years

Broken market

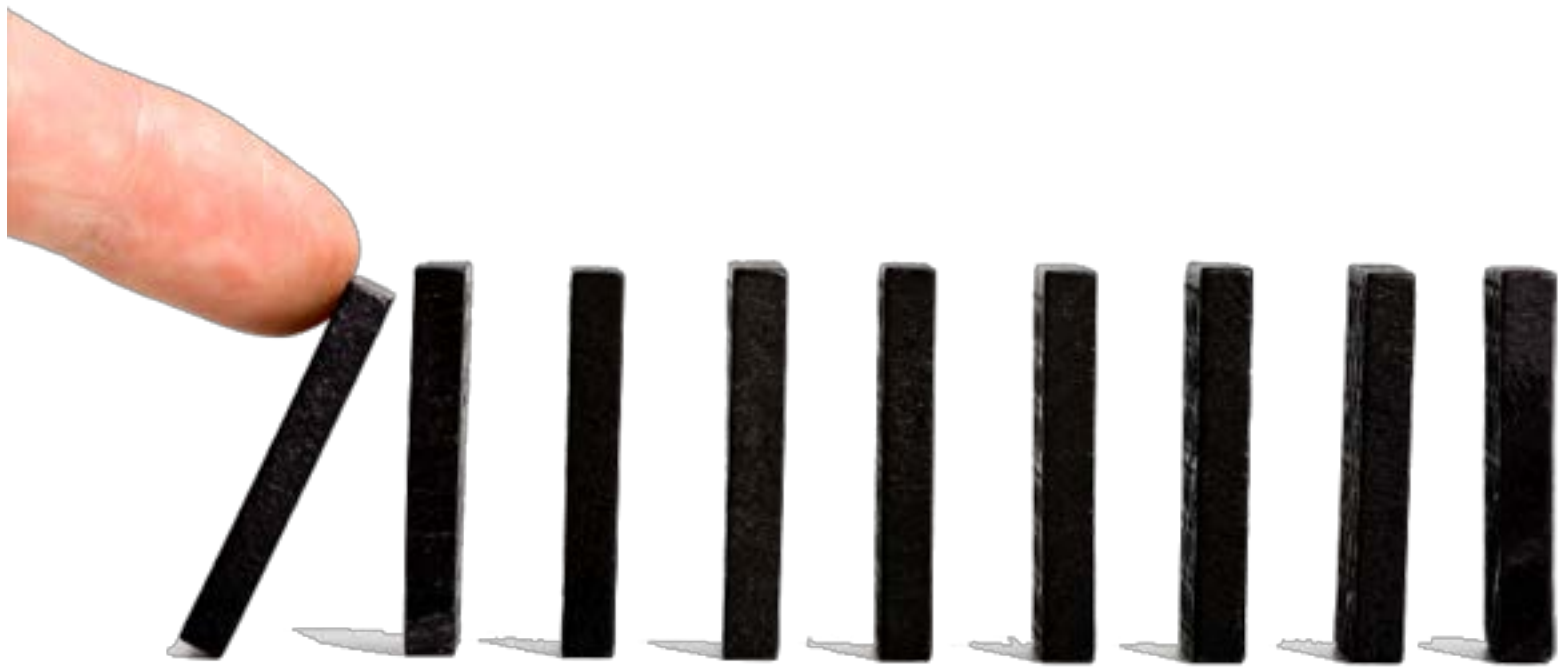
Resistance will always occur

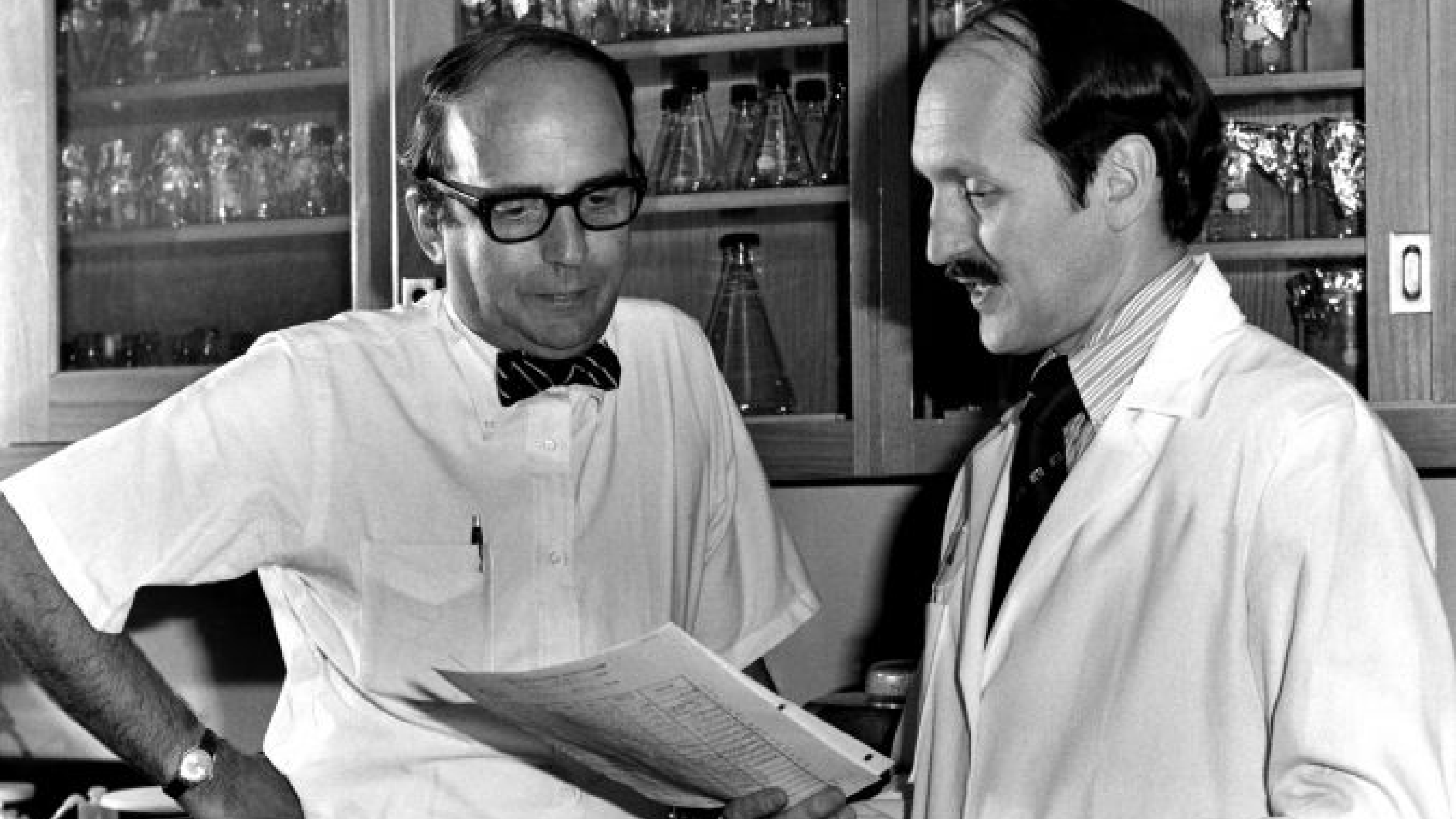
Where do we start?



Source: ESPAUR Report 2015, Public Health England

- Better IT adoption
- Lower acuity patients
- No onsite labs/clinical microbiologists





Widespread call for rapid diagnostics

the PHARMACEUTICAL JOURNAL
A Royal Pharmaceutical Society publication

News and analysis | Learning | Opinion | Research | Careers | Your

Antimicrobial resistance

Government review says antibiotics should not be prescribed without rapid diagnostic test

The Pharmaceutical Journal | 20 MAY 2016 | By Ingrid Torjesen

Report says developed countries should lead the way and build rapid testing to tackle antimicrobial resistance

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Rapid tests 'would cut antibiotic use'

Rapid diagnostic tests are urgently needed to help doctors know which patients need antibiotics, a report says.

RAPID DIAGNOSTICS:
STOPPING UNNECESSARY USE OF ANTIBIOTICS

THE REVIEW ON ANTIMICROBIAL RESISTANCE
CHAIRED BY JIM O'NEILL
OCTOBER 2015

Review on Antimicrobial Resistance
Tackling drug-resistant infections globally

nature International weekly journal of science

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News & Comment > News > 2016 > September > Article

NATURE | NEWS

Diagnostic developers target antibiotic resistance

Patient's immune response would tell physicians whether to prescribe.

Viviane Callier

09 October 2015

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When a patient shows up at the clinic with a cough and sore throat, there is no good way of discovering whether the infection is bacterial or viral. As a result, many clinicians prescribe

LONGITUDE PRIZE

THE RACE IS ON

Longitude Prize is a challenge with a £10 million prize fund to reward a diagnostic test that helps solve the problem of global antibiotic resistance. It is being run by Nesta and supported by Innovate UK as funding partner.

The Telegraph

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Two thirds of antibiotics are needlessly prescribed, a report warns

Economist Jim O'Neill has published a report which calls for more diagnostic procedures to help GPs avoid unnecessary prescriptions

Two thirds of antibiotics are needlessly prescribed, warns a report which says new diagnostics tests are urgently needed to curb their over-use.

theguardian
website of the year

No antibiotics without a test, says report on rising antimicrobial resistance

Report by economist Jim O'Neill says global cost of problem could be loss of 10 million lives a year by 2050 and $100tn a year

SCIENTIFIC AMERICAN

NCES MIND HEALTH TECH SUSTAINABILITY EDUCATION VIDEO PODCASTS BLOGS ST

HEALTH

A Faster Way to Diagnose Antibiotic Resistance

Novel test could slash wait time and curb inappropriate prescriptions

By Dina Fine Maron on December 17, 2014

NIH National Institutes of Health
Turning Discovery Into Health

Health Information | Grants & Funding | News & Events | Research & Training

NEWS RELEASES

Thursday, April 9, 2015

NIH funds nine antimicrobial resistance diagnostics projects

distribute.

theguardian
website of the year

Rapid diagnostic tools needed to fix antibiotic crisis, says review

Government paper says fundamental change is 'essential' to stop antibiotics being prescribed erroneously

PharmaTimes online

Search news, articles,

Report calls for rapid diagnostics to slash antibiotics use

Faster diagnostic tools that can distinguish between bacterial and viral infections are urgently needed in the UK to help reign in unnecessary prescriptions for

ft.com > reports >

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December 15, 2015 6:00 am

Race is on to end unecessary antibiotic prescriptions

Andrew Ward

Share Author alerts Print Clip Comments

Software will beat (and support) hardware

Cost

Hardware costs more than generic antibiotics.

Software can be delivered at zero marginal cost.

Adoption

Hardware requires separate devices, maintenance and consumables.

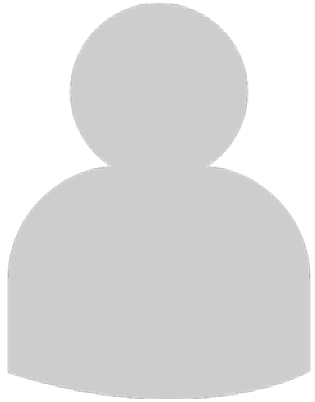
Can’t be integrated in the workflow and can’t provide a definitive diagnosis.

Technology

Suitable hardware diagnostics don’t yet exist.

High requirements for speed, scalability, accuracy and ease-of-use.

Drivers of overprescribing



Patient Expectation

Expect active treatment

Want a safety net

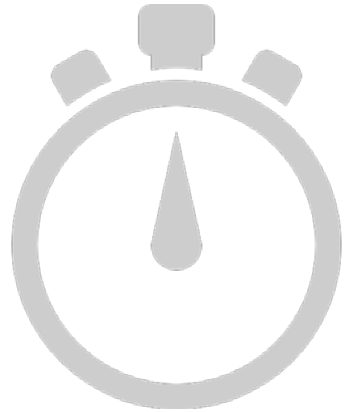
Poor public awareness

Clinician Confidence

Large degree of uncertainty

Unbalanced risks

Lack of feedback



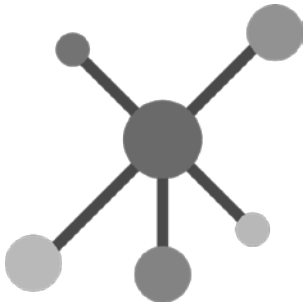
Time Constraint

Little time to educate

No time for POC tests

Minimal capacity for repeat appointments/follow-up

We’re combining three methodologies



Decision support

Enabling complex empirical decisions whilst maintaining clinical freedom

+

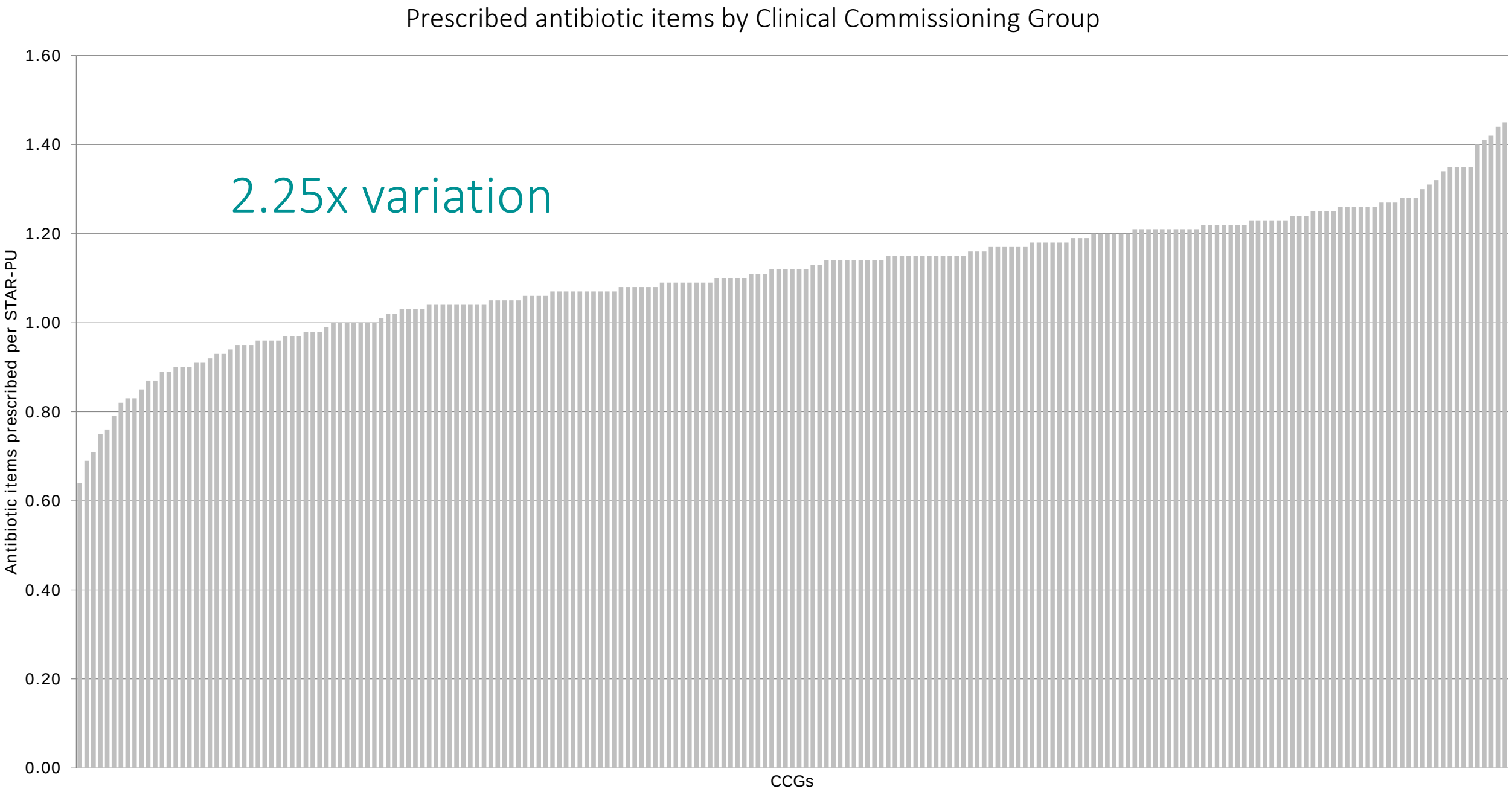
Behavioral nudges

Influencing decisions at the right point and in the right way whilst helping clinicians meet patient expectations

+

Data science

Synthesizing existing and new data sources to allow self-learning treatment decisions


Prescribed antibiotic items by Clinical Commissioning Group
2.25x variation
Antibiotic items prescribed per STAR-PU
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
CCGs

Medical history

Presenting symptoms

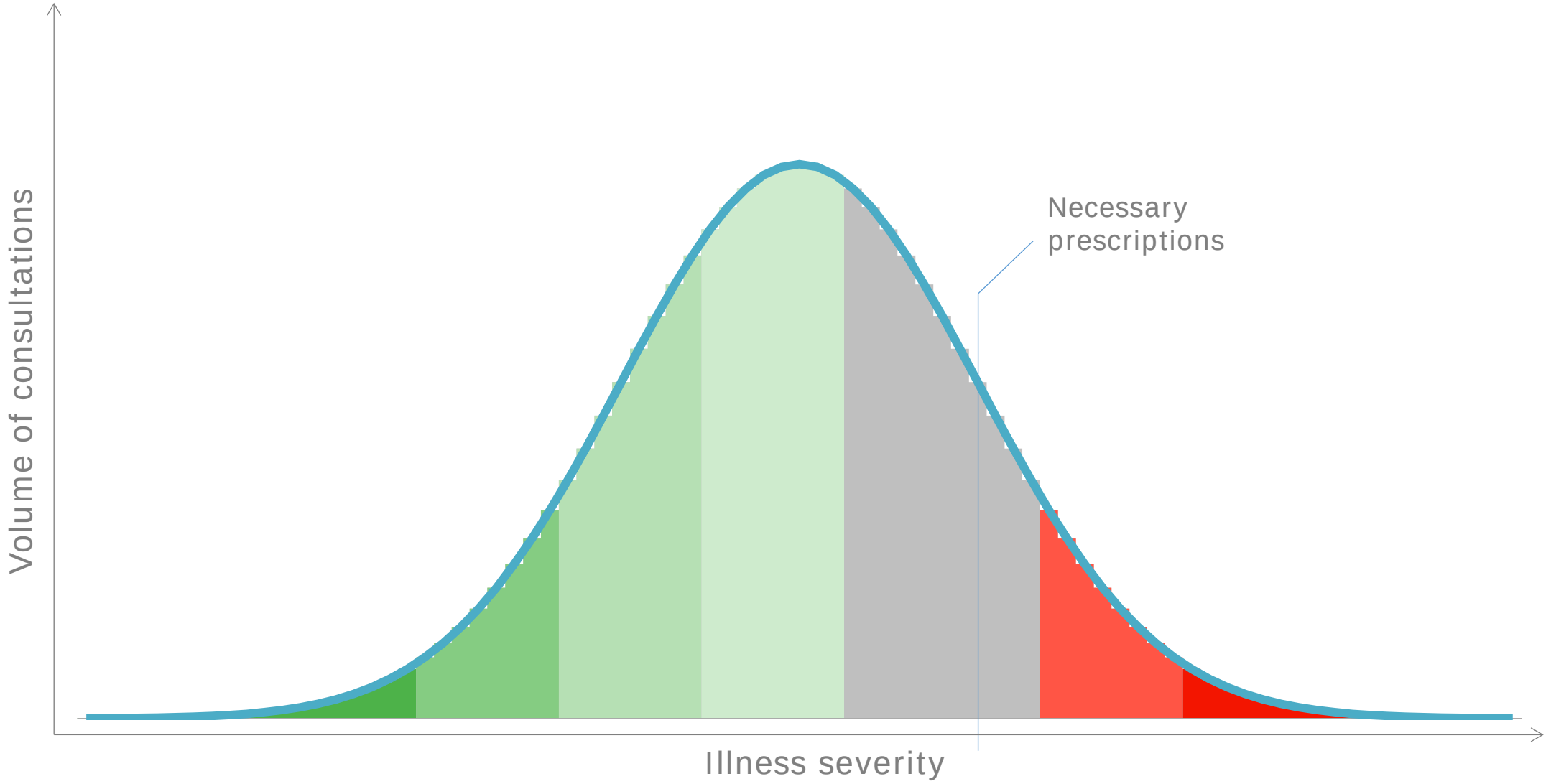
Treatment given

Clinical outcome

accuRx. dataset

Optimise for outcomes

Prescribing Accuracy



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Decision support based on existing guidelines, integrated into the workflow.

To gain adoption and gather structured data.

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Remote SMS management to offer an alternative to antibiotics and provide a safety net.

To gather outcomes and adapt the workflow.

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Data-driven rapid diagnostic that is patient-specific and self-learning.

To eliminate inappropriate antibiotic use.

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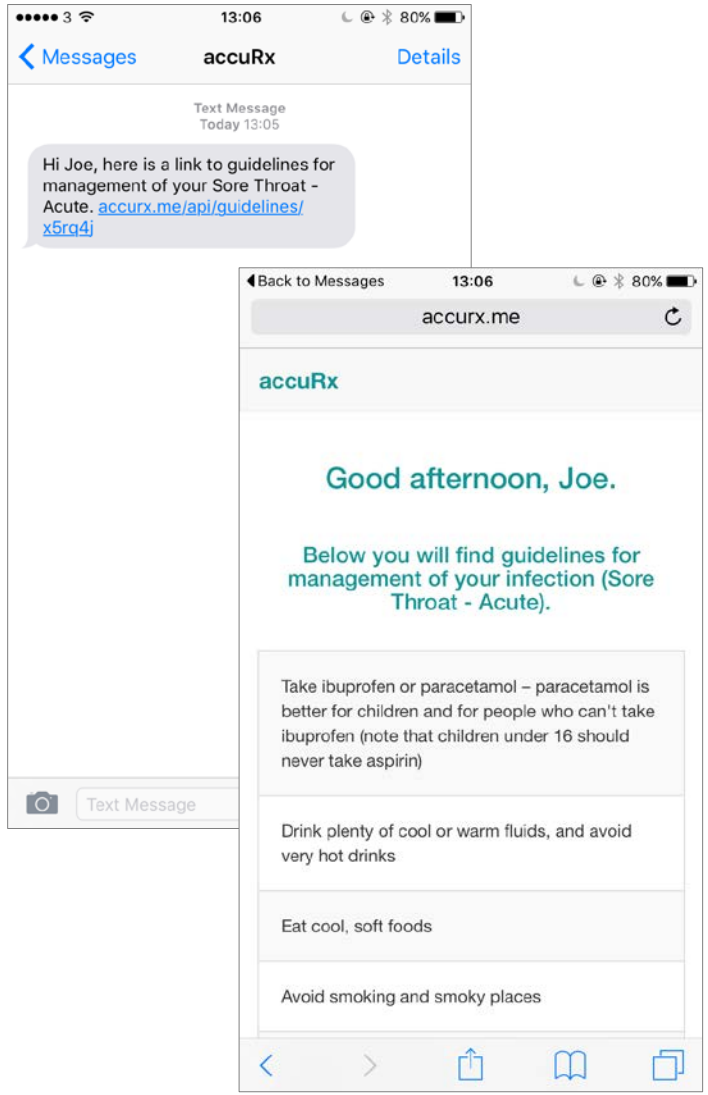
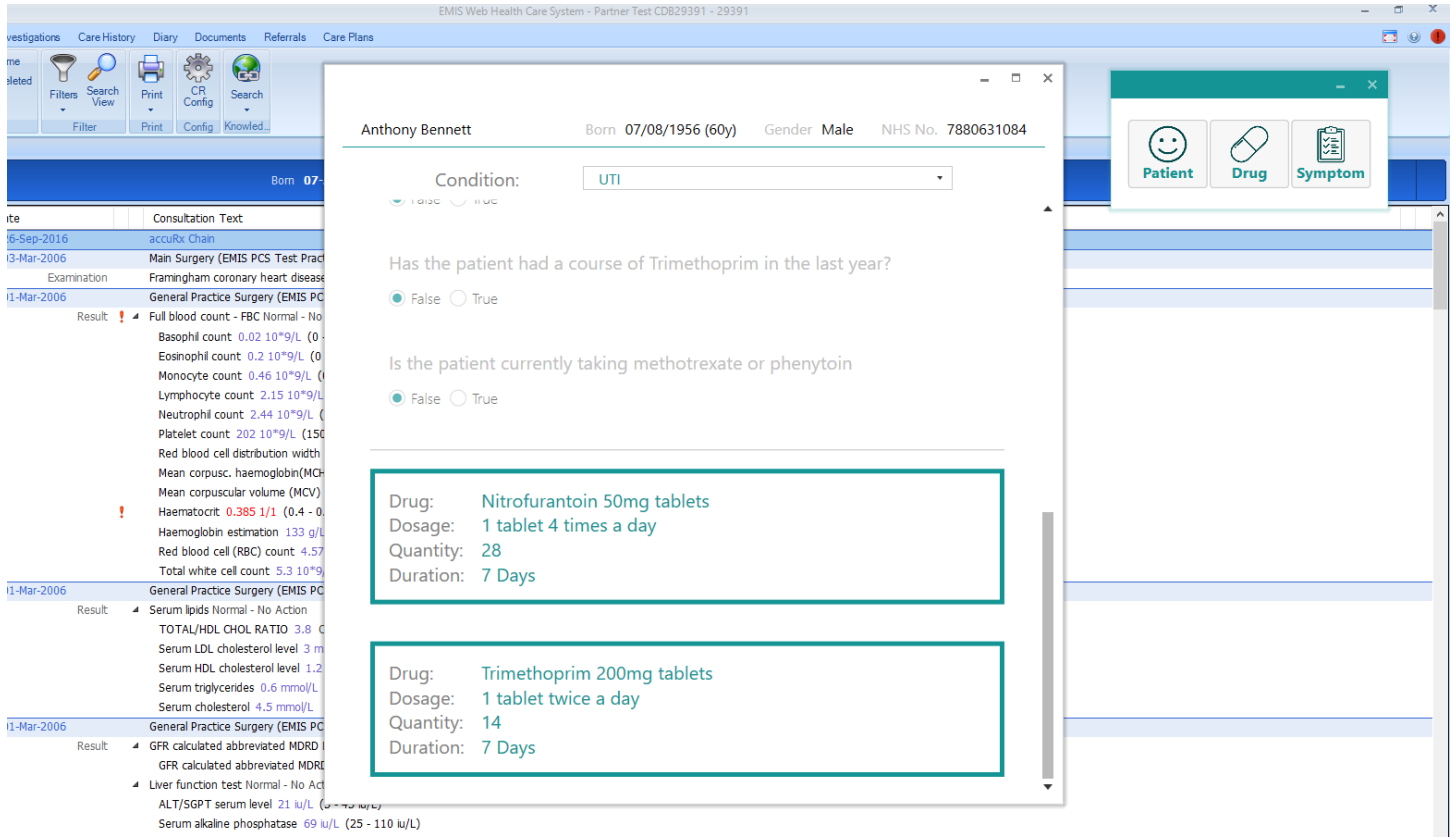
Patient advice:



Smart formulary:



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Active Management

Meeting patient expectations for active treatment without prescribing, whilst providing GPs with a safety net

Smart Delayed Prescribing

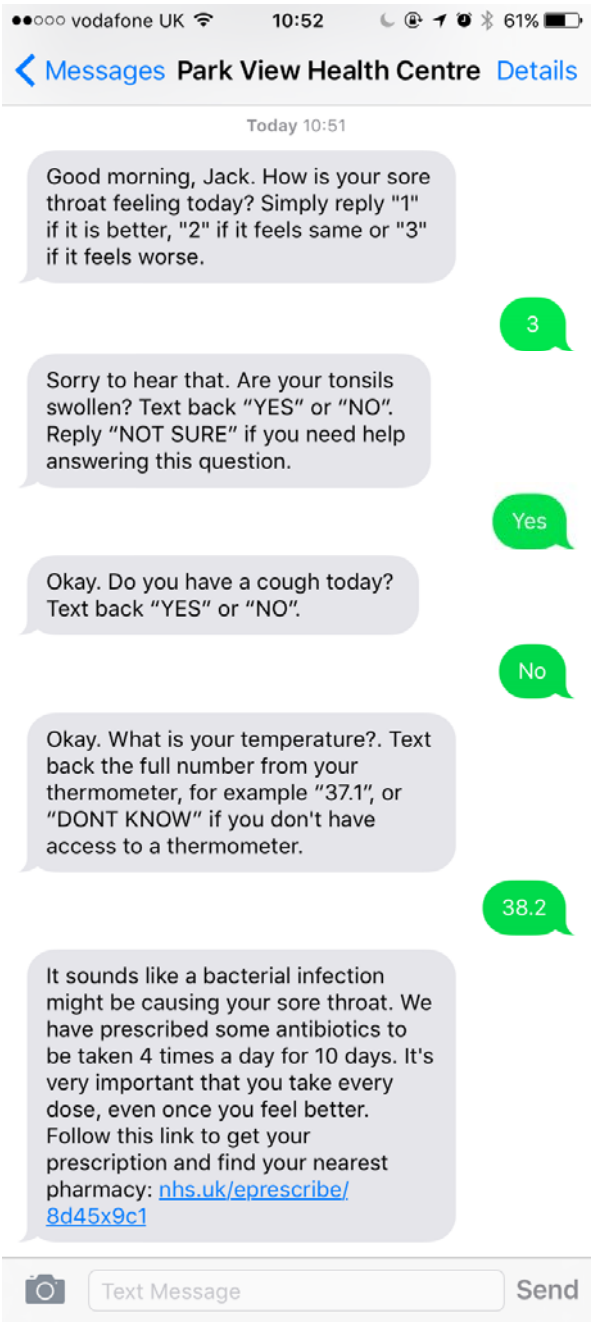
Delaying the decision point to prescribe and unlocking prescriptions on logic chosen in the consultation e.g. patient reported symptoms or lab results

Course Adherence Nudges

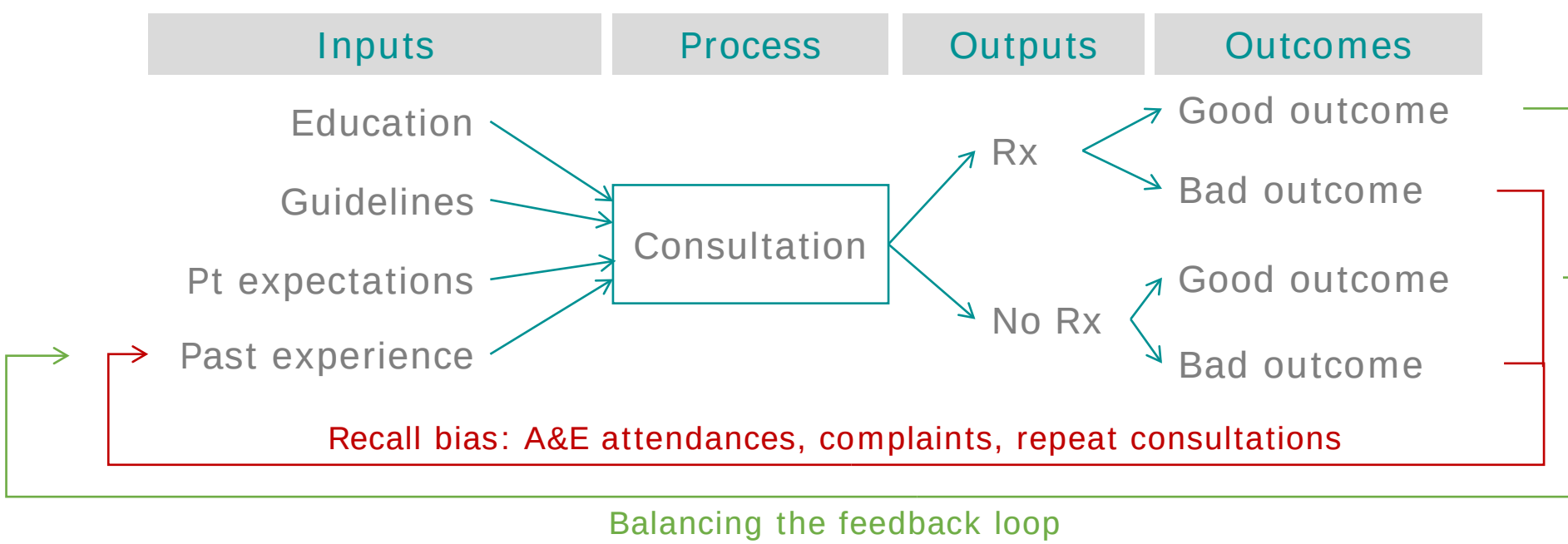
Engaging patients in the management of infection and improved medication compliance

Outcomes Collection

Collecting an unbiased set of patient-reported outcomes, linked to their consultation information



Outcomes Collection



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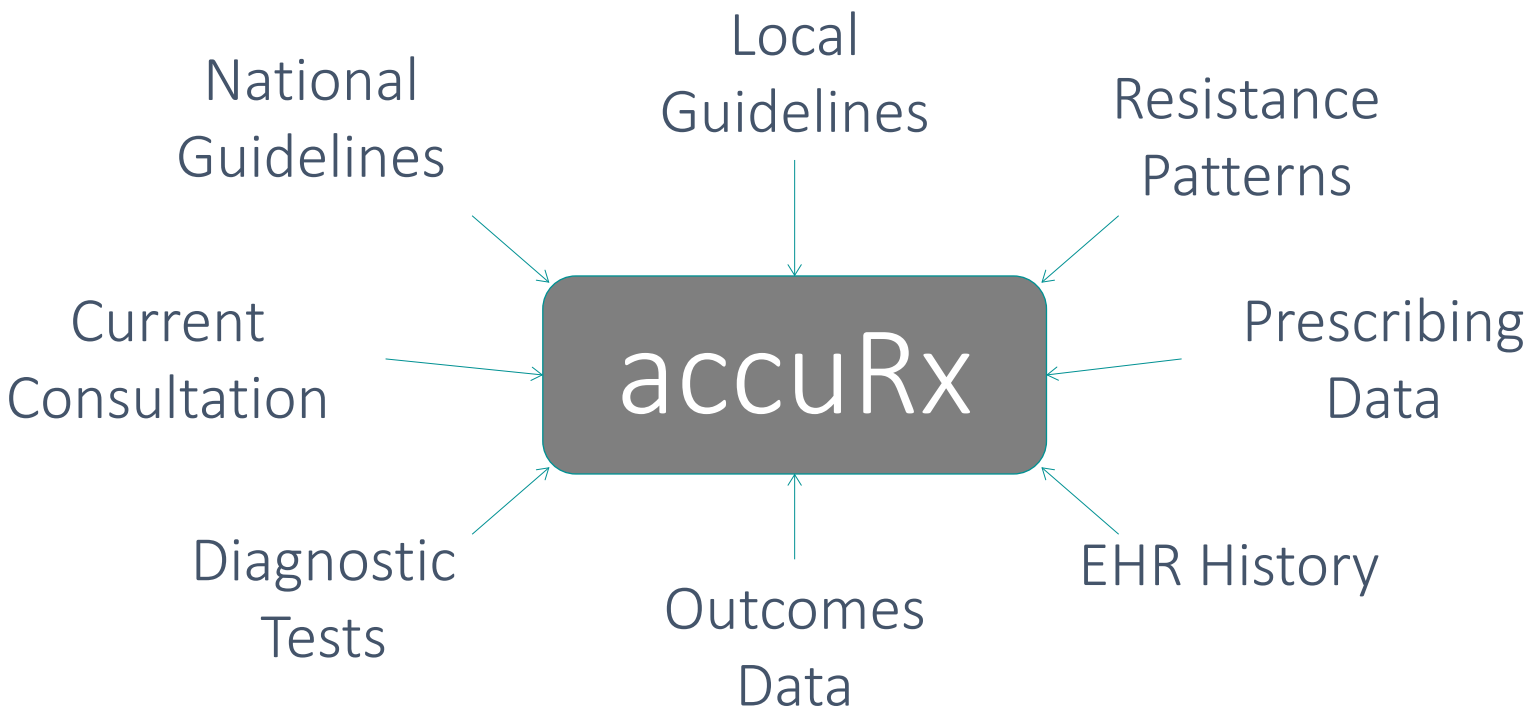


GP benefits: Operational support

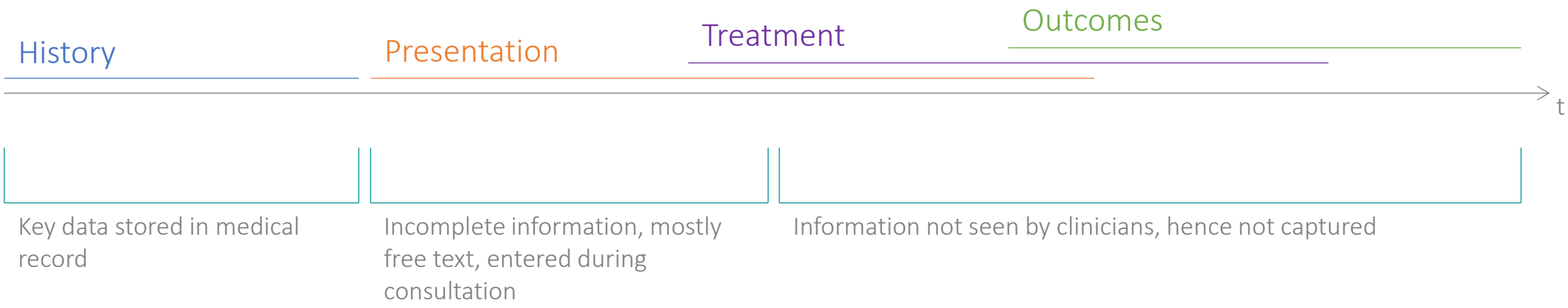
- Time saving
- Skill mix support
- Improved prescribing
- Improved patient safety
- Improved patient experience
- Improved audit trail

Challenges

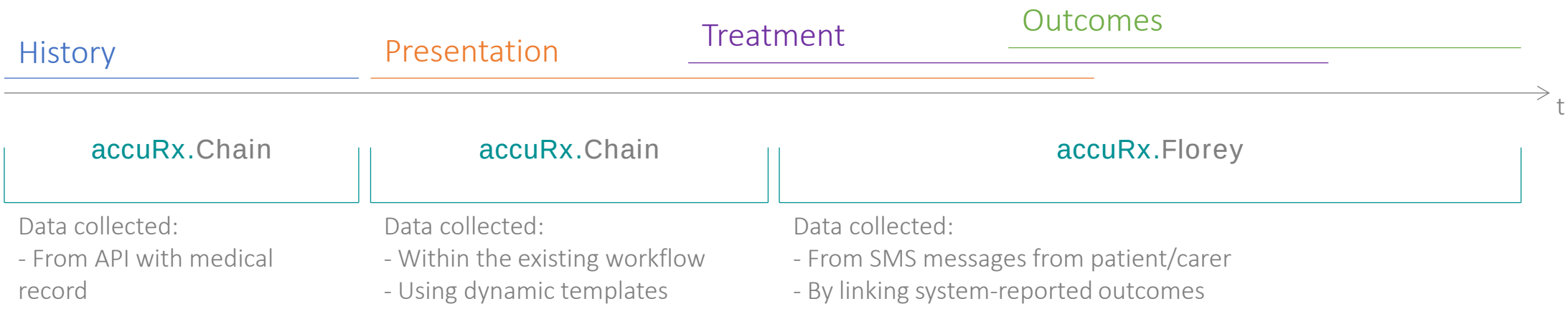
- Converting political priorities to local ones
- Lack of market or incentives
- Focus on diagnostics
- Iterating in healthcare
- Getting into the workflow
- Focus!
- Guideline limitations

Each datapoint is a timeline of events

Data availability is limited and quality is low



We collect this data



Latent Variable Modeling: PCA