Risk prediction

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Why predict risk?

People experience adverse and costly health events;

- a stroke / acute myocardial infarction
- a fall >> hip or forearm fracture
- an unplanned hospital admission
- death

If we could predict these events then we could;

- set health insurance premiums at appropriate levels
- allocate healthcare funding / set capitated budgets / at an appropriate level

If we could predict these events **and** intervene to reduce the risk of the event then we could;

- reduce the frequency of adverse events
- improve the quality of people's lives
- reduce (net) healthcare costs

Predicting emergency admissions

Lots of tools

Combined predictive model, PRISM, PEONY, QAdmissions, HARP, ACGs

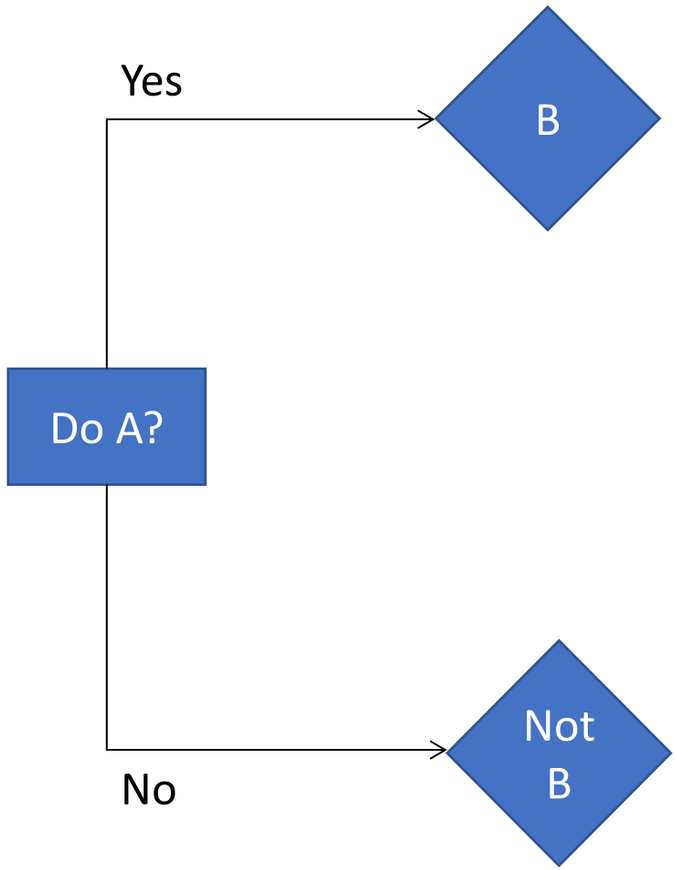
Lots of initiatives

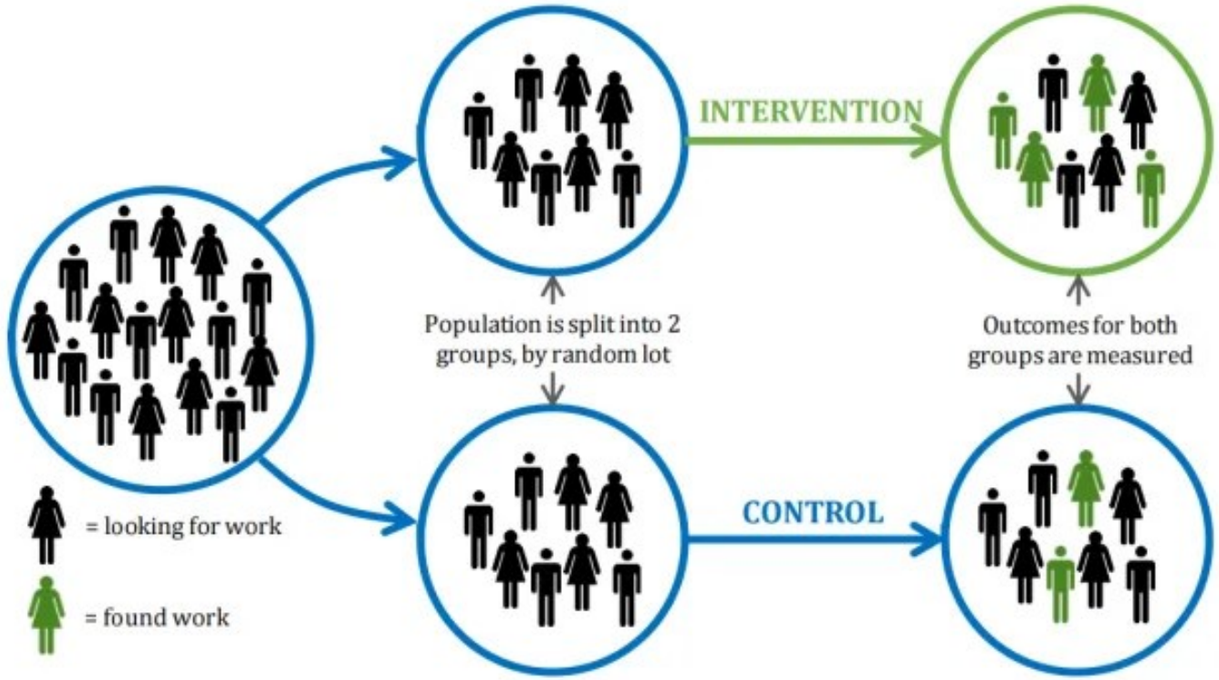
NHS England - Enhanced Service Specification - Avoiding Unplanned Admissions: Proactive Case Finding and Patient Review for Vulnerable People enhanced service (*£480M over 3 years)*

NHS Wales - QOF Quality and Productive Indicators

Population health management

Draft PCN specification





Control groups eliminate rival explnations

Predictive risk stratification model: a randomised stepped-wedge trial in primary care (PRISMATIC)

Objective: To measure the effects on service usage and associated costs , and on mortality, quality of life and satisfaction of deploying a risk stratification tool (PRISM) on primary care.

Intervention: Provision of risk stratification tool to practices, along with training and support.

Participants: 230,000 patients in 32 practices in South Wales.

Study design: Randomised step-wedge study design with qualitative and economic components.

Snooks H, Bailey-Jones K, Burge-Jones D, Dale J, Davies J, Evans B, et al. Predictive risk stratification model: a randomised stepped-wedge trial in primary care (PRISMATIC). Health Serv Deliv Res 2018;6(1).

https://njl-admin.nihr.ac.uk/document/download/2012003

Results

Outcome	**Impact** (per 100 patients per year)	**95% confidence interval**
Emergency hospital admissions	+ 1.1	(1.0 to 1.3)
A&E attendances	+ 3.0	(2.8 to 3.2)
GP events		
Outpatient visits		
Hospital days		
Intervention costs		
Cost of changes in healthcare use		

Given the uncertainties, consider design stage evaluation before taking the final decision to implement.

If it doesn’t stack up in theory, it’s unlikely to in practice.

Will risk prediction save money

A is the average cost of an adverse event;

PPV is the positive predictive value of a tool which aims to identify patients who will have an adverse event in a given period;

NNT is the number of people that need to receive the intervention in order to avoid one adverse event; and

I is the unit cost of an intervention to prevent an adverse event which is delivered to those identified by the predictive risk tool then,

I < A.PPV/NNT for the intervention to save money.

A worked example

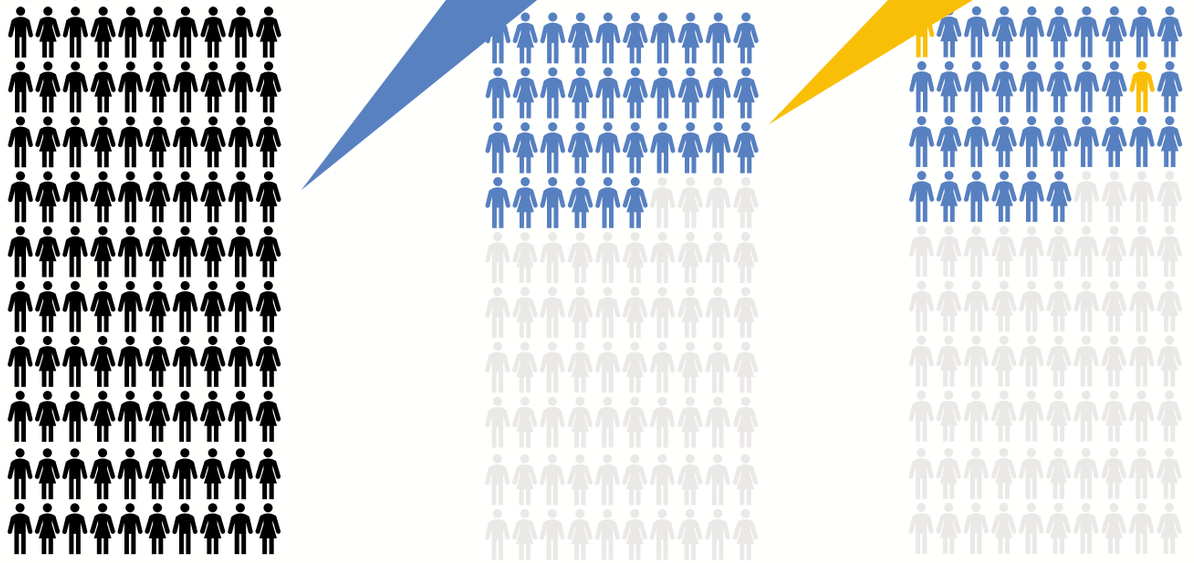
From a practice of 5,000, a risk tool identifies 100 individuals (top 2%) having the highest risk of unplanned admission in the next 12 months

Positive predictive value (PPV)

What proportion of these 100 people will be admitted in the next 12 months?

Number needed to treat (NNT)

How many people need to receive the intervention to avoid one admissions?



2 admissions avoided

Let's assume £2000 per admission

How much must your intervention cost per person to save money?

I < A.PPV/NNT

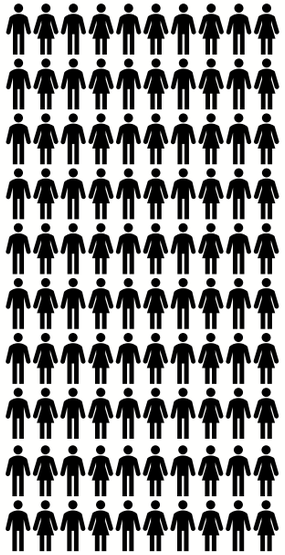
Anticoagulants – Patients with Atrial Fibrillation – to prevent one ischemic heart attack – 40
Beta-blocker – Heart failure – to prevent one hospitalisation – 110
NRT – smokers – to support one person to quit – 15
Aspirin – patients at risk of CVD - to prevent one non-fatal heart attack – 333

A worked example

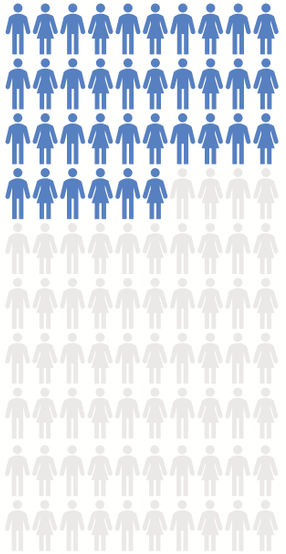
PPV = 0.36

NNT = 18

From a practice of 5,000, a risk tool identifies 100 individuals (top 2%) having the highest risk of unplanned admission in the next 12 months



36 would have experienced an emergency admission in the next 12 months



For every eighteen people treated, one emergency admission is avoided

2 admissions avoided

Let's assume £2000 per admission

How much must your intervention cost per person to save money?

I < A.PPV/NNT
2000*0.36/18
<£40

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Lacks empirical evidence – revise theory

Share your insights…

Any key insights...

So what…

(any scope for application)

One wish…

Reflections