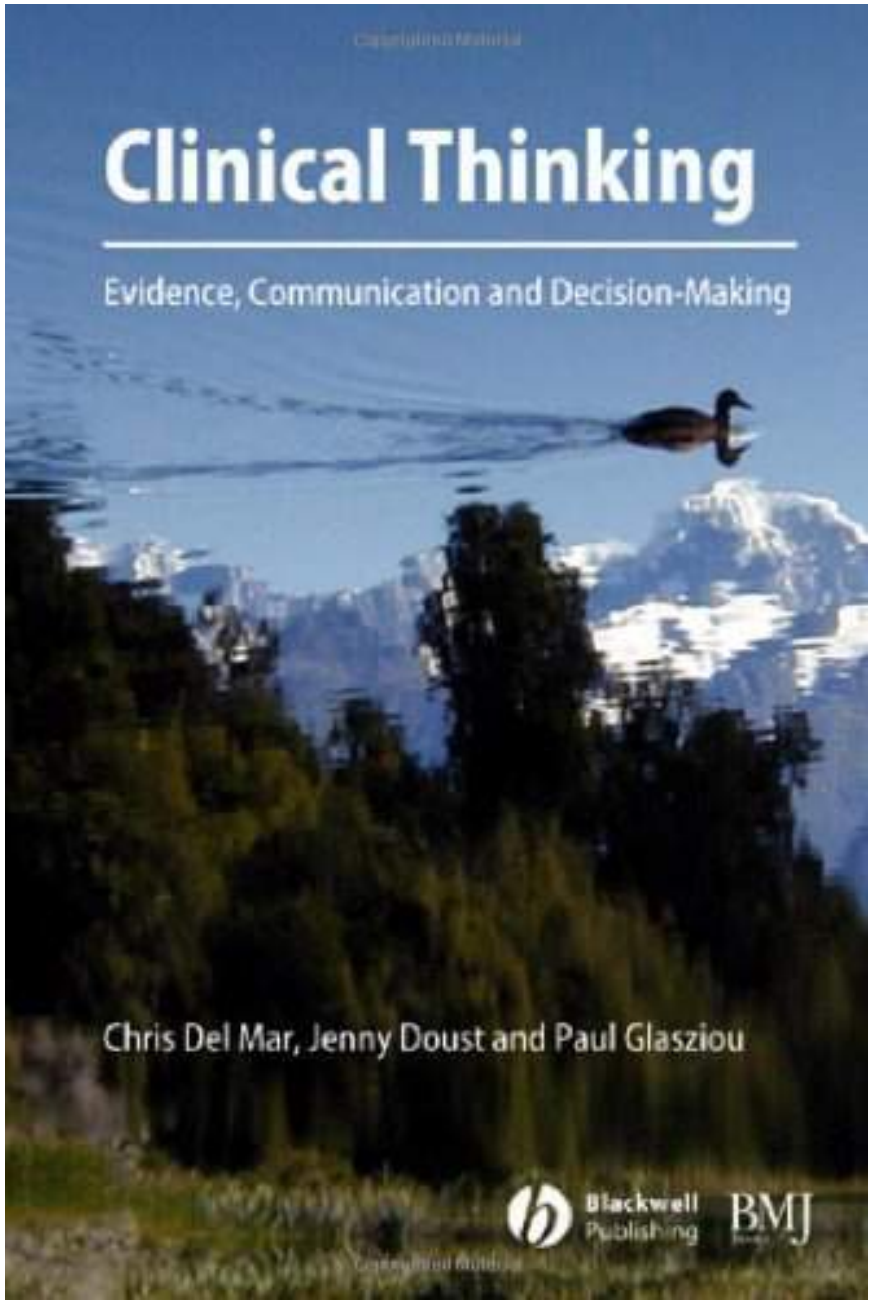
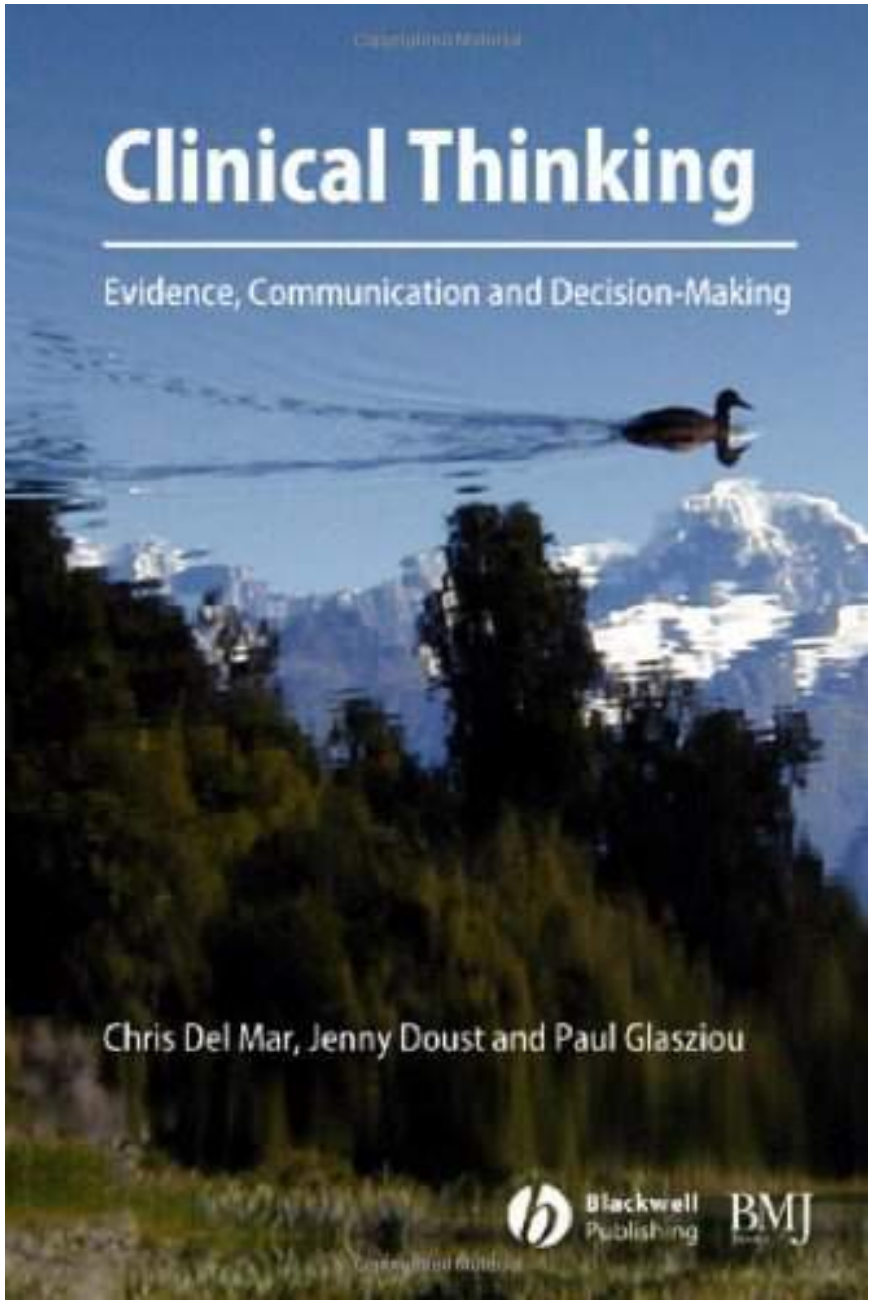

Clinical Thinking
Evidence, Communication and Decision-Making
Chris Del Mar, Jenny Doust and Paul Glasziou
Blackwell Publishing
BMJ

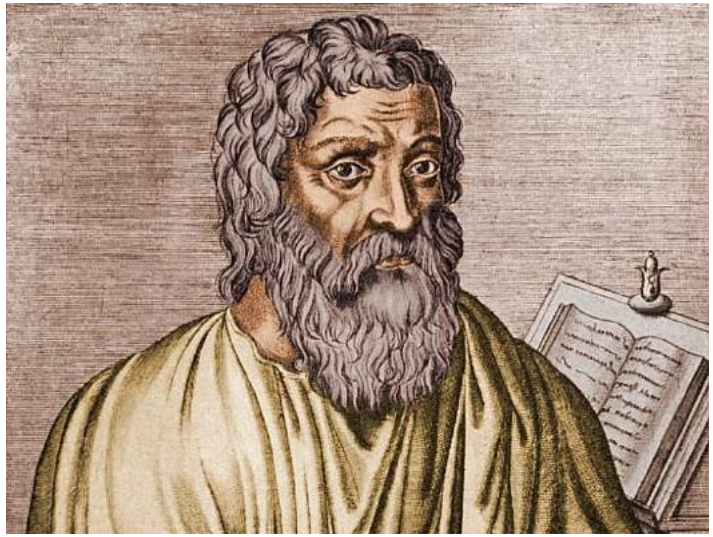


The traditional model of clinical practice incorporates diagnosis, prognosis, and treatment

DIAGNOSIS is the crucial skill of the doctor…..

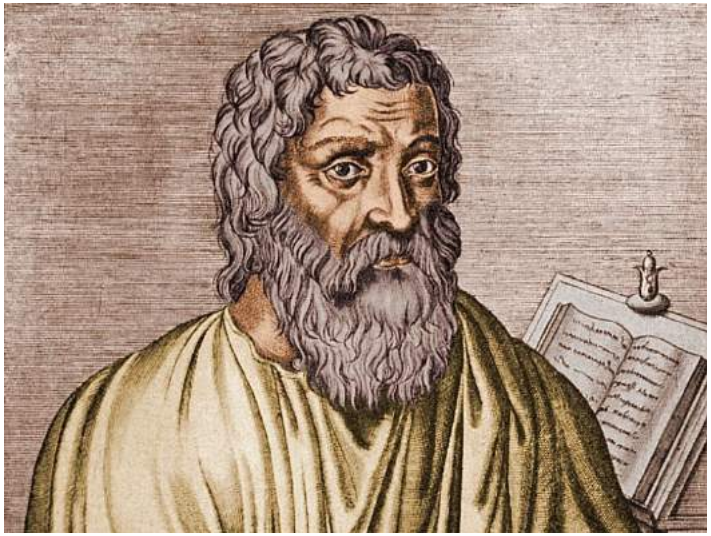
It leads to treatment and cure…..

But what happened before a science of the human body emerged?



Hippocrates

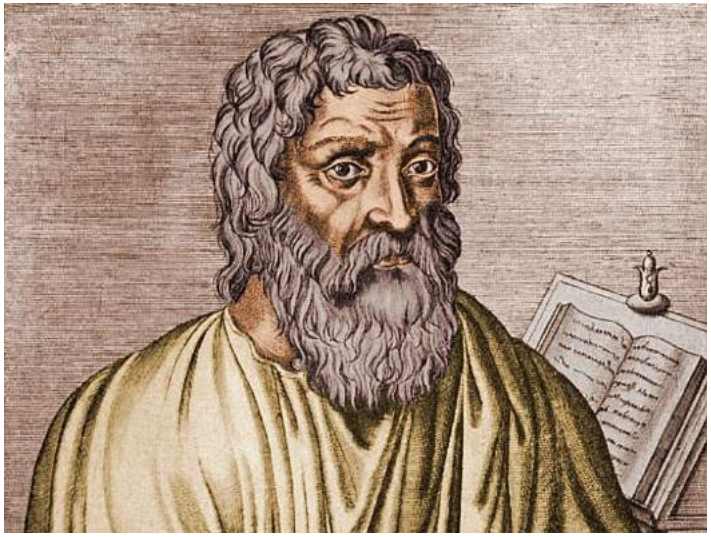
5th century BCE



Hippocrates

5th century BCE

The huge variation in outcomes of sick people was recognised



Hippocrates

5th century BCE

“ it is a most excellent thing for a physician to cultivate prognosis …… predicting and foretelling……”

Galen

2nd century CE

"Patient trust was essential in the healing process. It could be won by ….mastery of prognosis, an art demanding experience, observation and logic"

The scientific era

17th century onwards

Diagnosis based on pathological mechanisms

Diagnosis as an end in itself

Thomas 1930

"medical specialists…..our task for the future was to be diagnosis and explanation"

But prognosis continued……..

The Sentence of Death
John Collier
Wolverhampton Art Gallery

The modern era:
Diagnosis and treatment

- The child with a fever
- The man with a sudden onset of headache
- The woman with a lump in her breast

The modern era:
Diagnosis and treatment

- The child with a fever
- The man with a sudden onset of headache
- The woman with a lump in her breast

…and prognosis disappeared
from the textbooks (Christakis)

Arthritis Research UK | primary care centre

Keele University

Prognosis versus diagnosis: a discussion in seven parts

Peter Croft

Croft et al BMC Medicine 2015 13:20

PROGRESS

London School of Hygiene & Tropical Medicine | Keele University | Queen Mary University of London | University of Oxford | University of Birmingham | UCL

DEFINITIONS - diagnosis

- **Diagnosis:**

  Greek: “know apart from” = to “distinguish”.

  Method of classifying symptoms and illnesses.

  It became an ability to recognise and classify according to a system of underlying disease pathology or mechanisms

  As a clinician, it is my ability to judge, given the available information, the probable pathology underlying the patient’s illness. It is about **a patient’s current state.**

WORDS - diagnosis

- You have got gout
- This patient has diabetes
- I think you may have an infection in your lung
- The Xray shows no serious cause for your back pain

DEFINITIONS - prognosis

- **Prognosis:**

  Greek: “knowing before” = to “forecast”.

  Method of classifying sick people.

  It became an ability, based on clinical experience, to predict a likely outcome in patients **OR** to describe the likely course of a disease

  As a clinician, it is my ability to predict the probable future outcome for an individual patient, given the currently available information. It is about predicting **the likelihood of a patient’s future state.**

WORDS - prognosis

- I am afraid the outlook for your father is not good
- You have a mild infection of your throat, it doesn’t need any treatment and you will be better in a few days
- If we can get her to hospital quickly, there is a good chance she will recover completely
- This type of lung cancer has a poor prognosis

Some key points

- Both are probabilities
- Both rely on available information
- Treatment is traditionally contingent on diagnosis
- Prognosis is partly contingent on treatment given and its effect

PROGNOSIS

The risk (probability, likelihood) of future outcomes and events

Group and individual

Why Prognosis Now?

The modern era:
Diagnosis and treatment

- The child with a fever
- The man with a sudden onset of headache
- The woman with a lump in her breast

The modern era:
Diagnosis and treatment

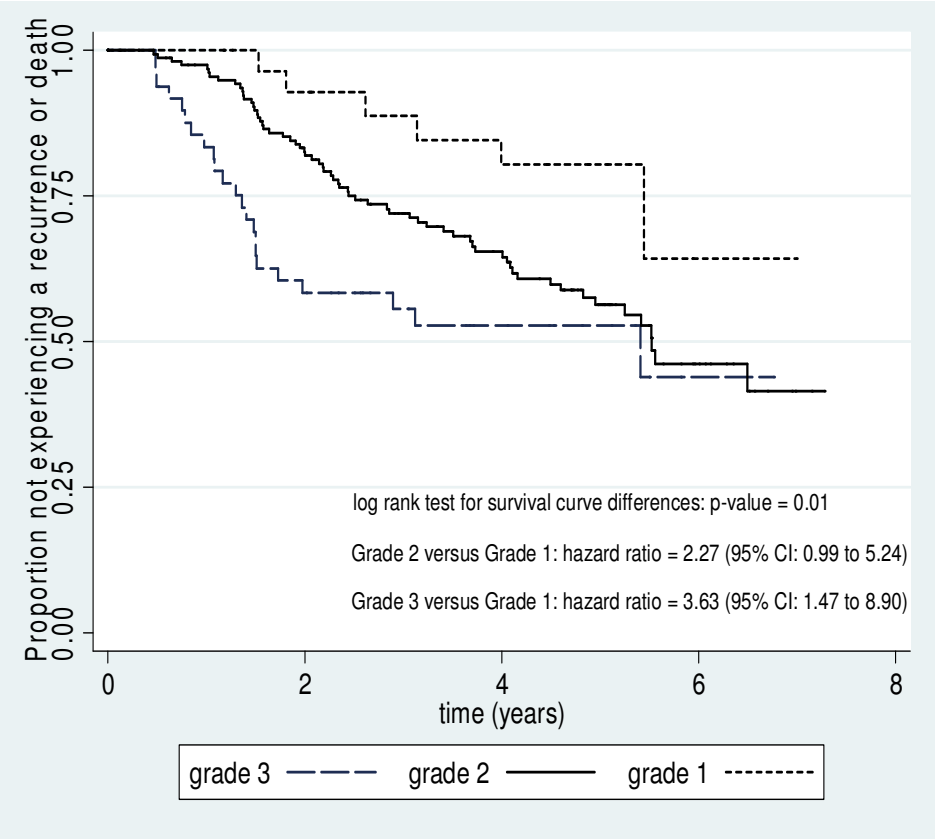
- The child with a fever
- The man with a sudden onset of headache
- The woman with a lump in her breast

…so prognosis has never really gone away

Part 1: VARIABILITY IN OUTCOMES

Survival among women with breast cancer

Fig1: Average survival by grade



Survival among women with breast cancer

Fig1: Average survival by grade

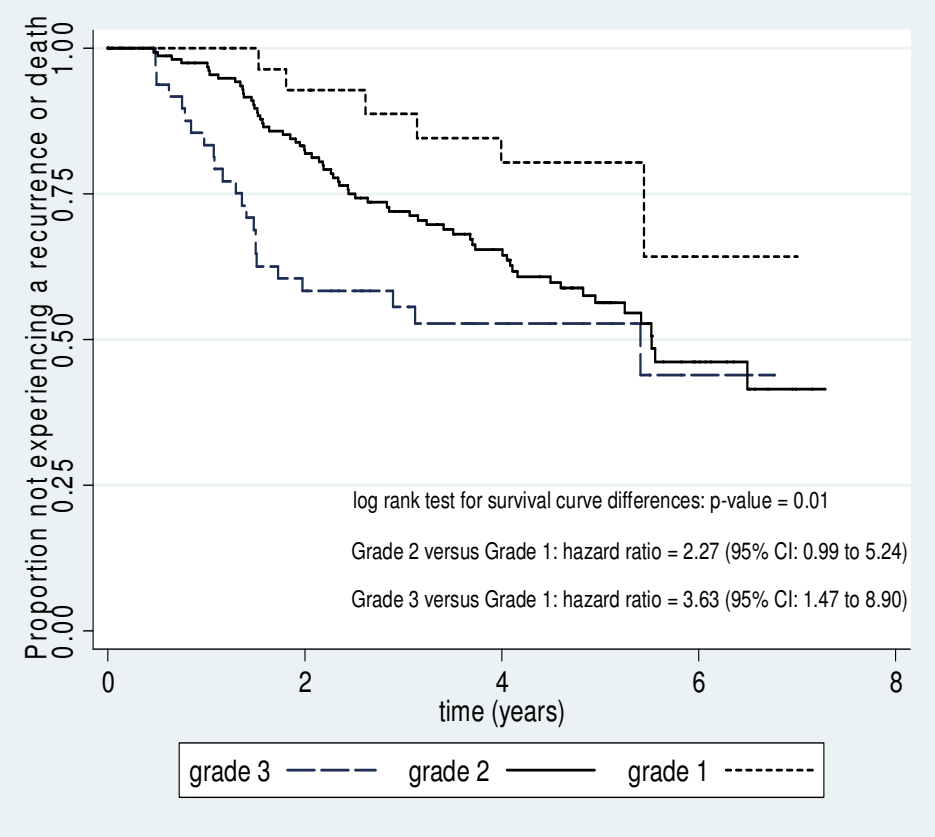
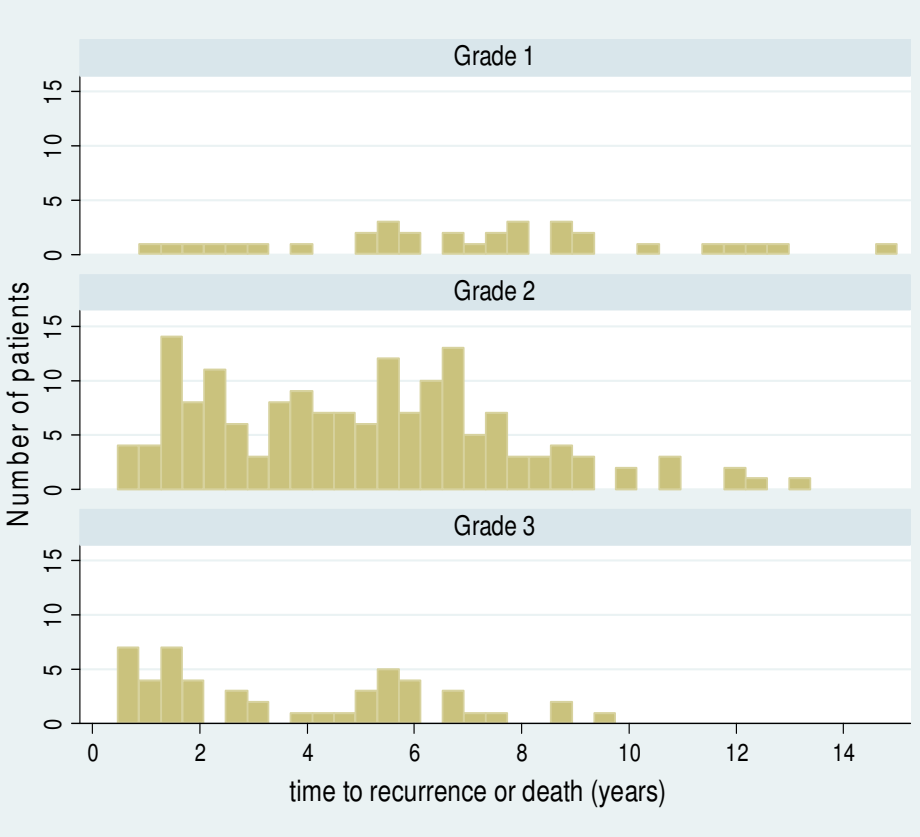


Fig 2: Variability about average




Healthy
Diagnosis
Diseased
Prognosis

Sidney Watson Smith 1882-1950
General Practitioner and Consultant Physician

THE 1936 OUTBREAK OF TYPHOID FEVER

at Poole, Bournemouth and Christchurch

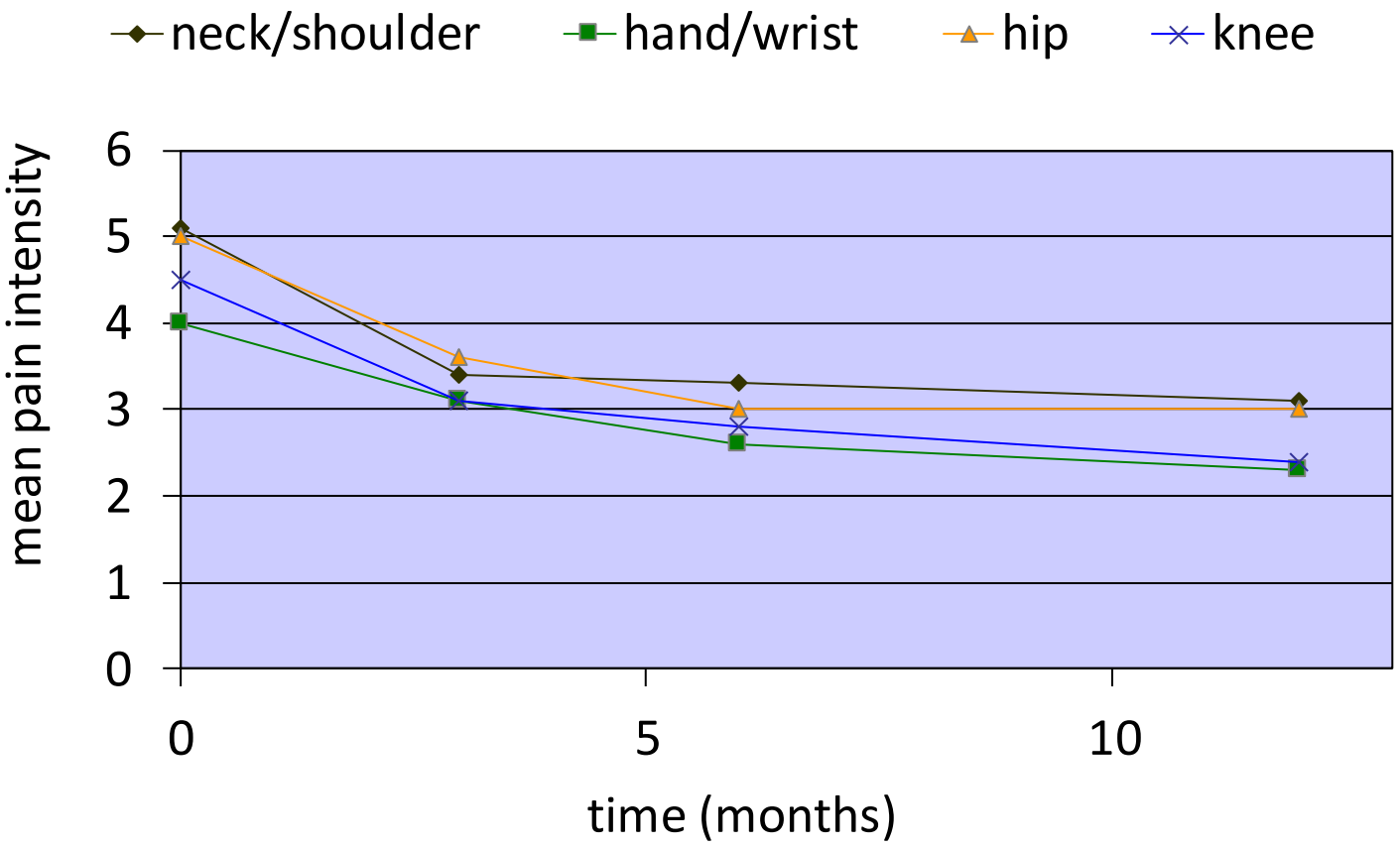
With special reference to Clinical Features and to Treatment of Patient and Disease

PROGNOSIS.

A patient with typhoid fever usually inclines to recovery: it is a natural proclivity in one with the disease. What adds to its seriousness, however, is the wide range of complications: it is this fact that contributes most to the death-rate. A great deal

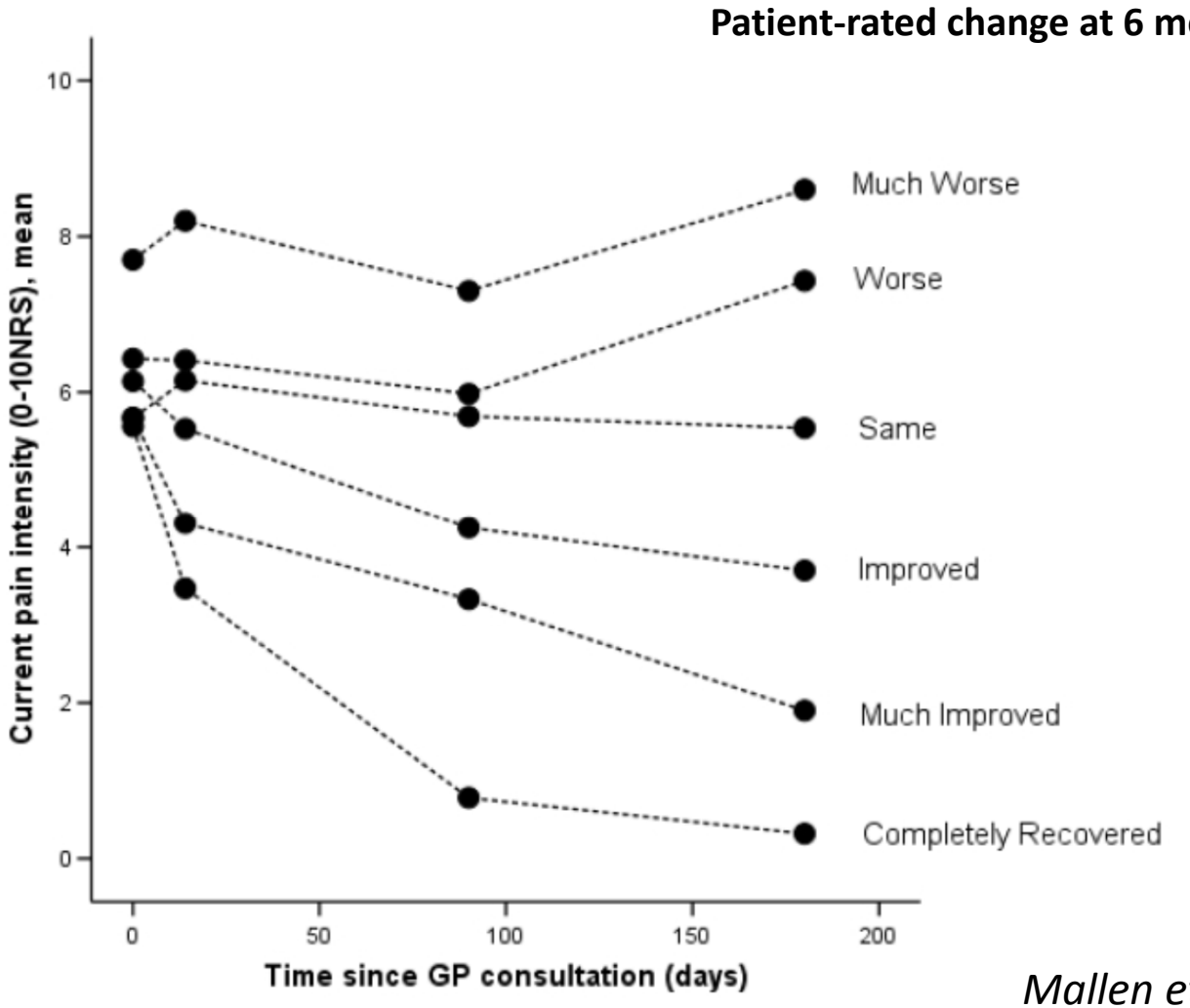
Course over time: musculoskeletal pain

Course of pain intensity after consulting in Dutch primary care



COURSE OVER TIME:

All painful musculoskeletal conditions presented to primary care 50-plus year olds



Mallen et al under review

Can we understand, communicate, use, and reduce variability in outcome?

Part 2. A USEFUL DIAGNOSIS IS DEFINED BY PROGNOSIS

The feverish child: I

The feverish child: II

- Diagnostic challenge: Who has a urinary tract infection?
- Diagnostic gold-standard: Bacteria in the urine
- Diagnostic clinical prediction rule at presentation selects children with higher probability of bacteriologically-positive urine to undergo urine testing

The feverish child: II

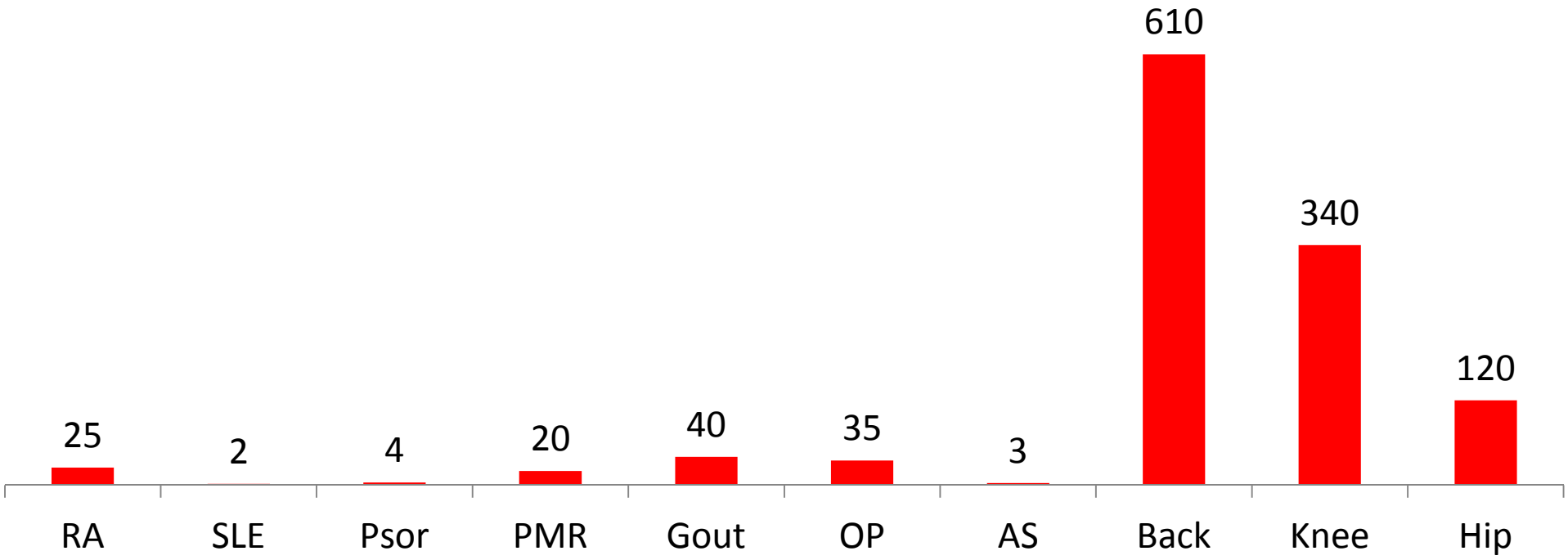
- Diagnostic challenge: Who has a urinary tract infection?
- Diagnostic gold-standard: Bacteria in the urine
- Diagnostic clinical prediction rule at presentation selects children with higher probability of bacteriologically-positive urine to undergo urine testing
- **Prognostic question: Does this approach improve the outcomes for those tested and those who are not, compared with “treat all”**

Part 3. PROGNOSIS IDENTIFIES OVERDIAGNOSIS

DAILY MAIL

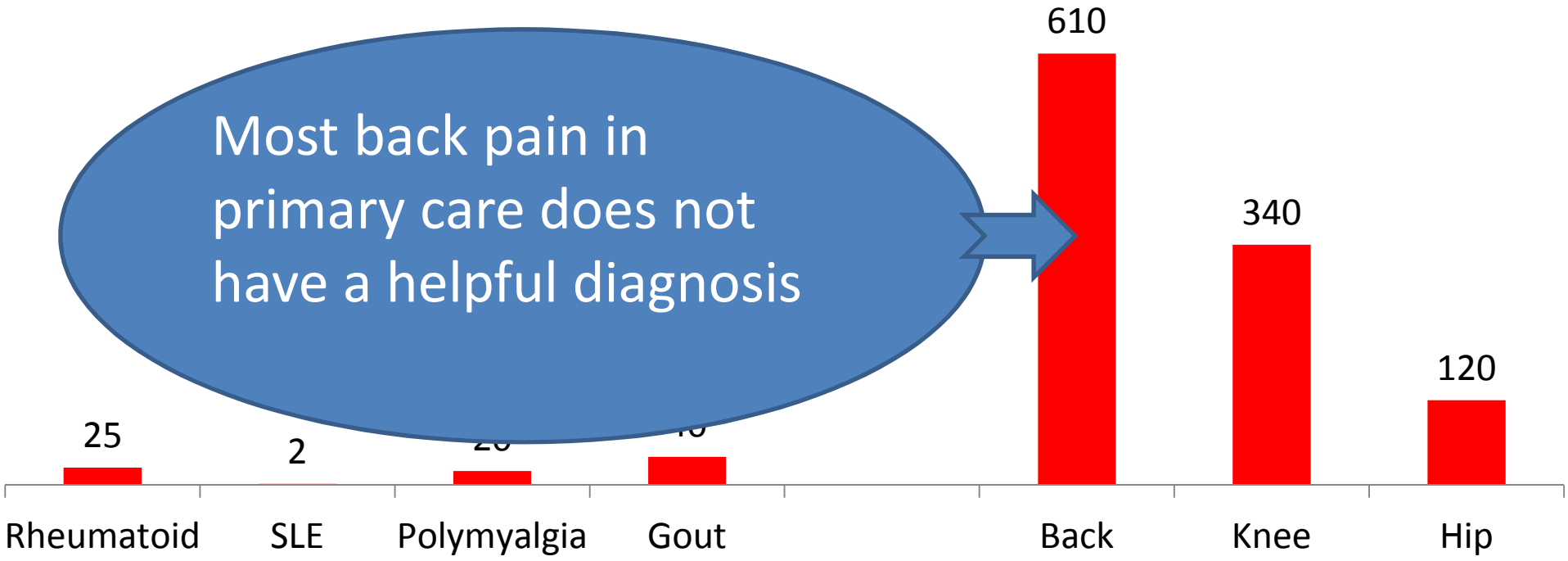
Healthy hit by a plague of overdiagnosis of conditions that will never cause serious symptoms

Number of patients consulting in a year in a practice of 10,000 registered persons



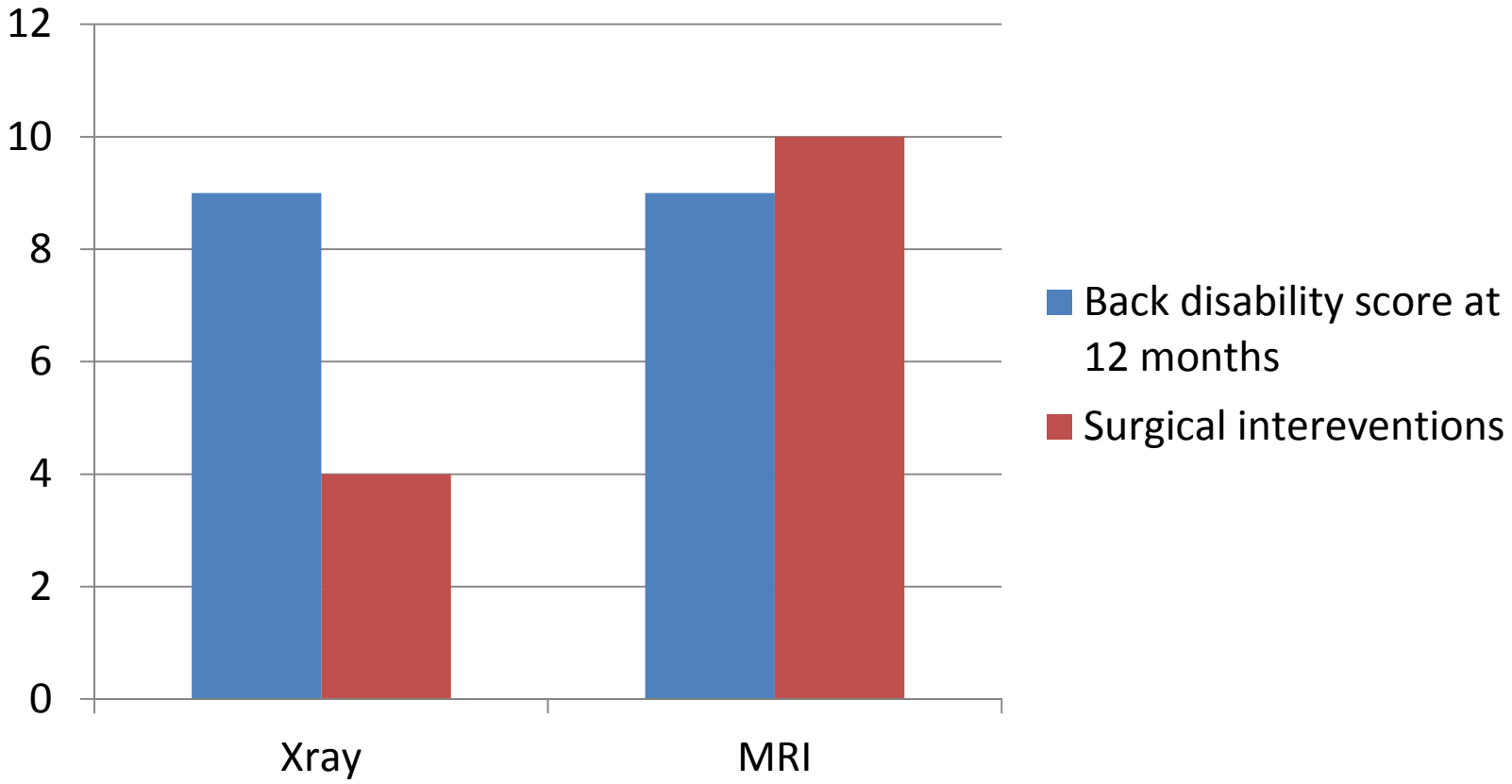
Jordan K. Keele CiPCA database

Number of patients consulting primary care per year in a practice of 10,000 registered persons



Jordan K

MRI for back pain

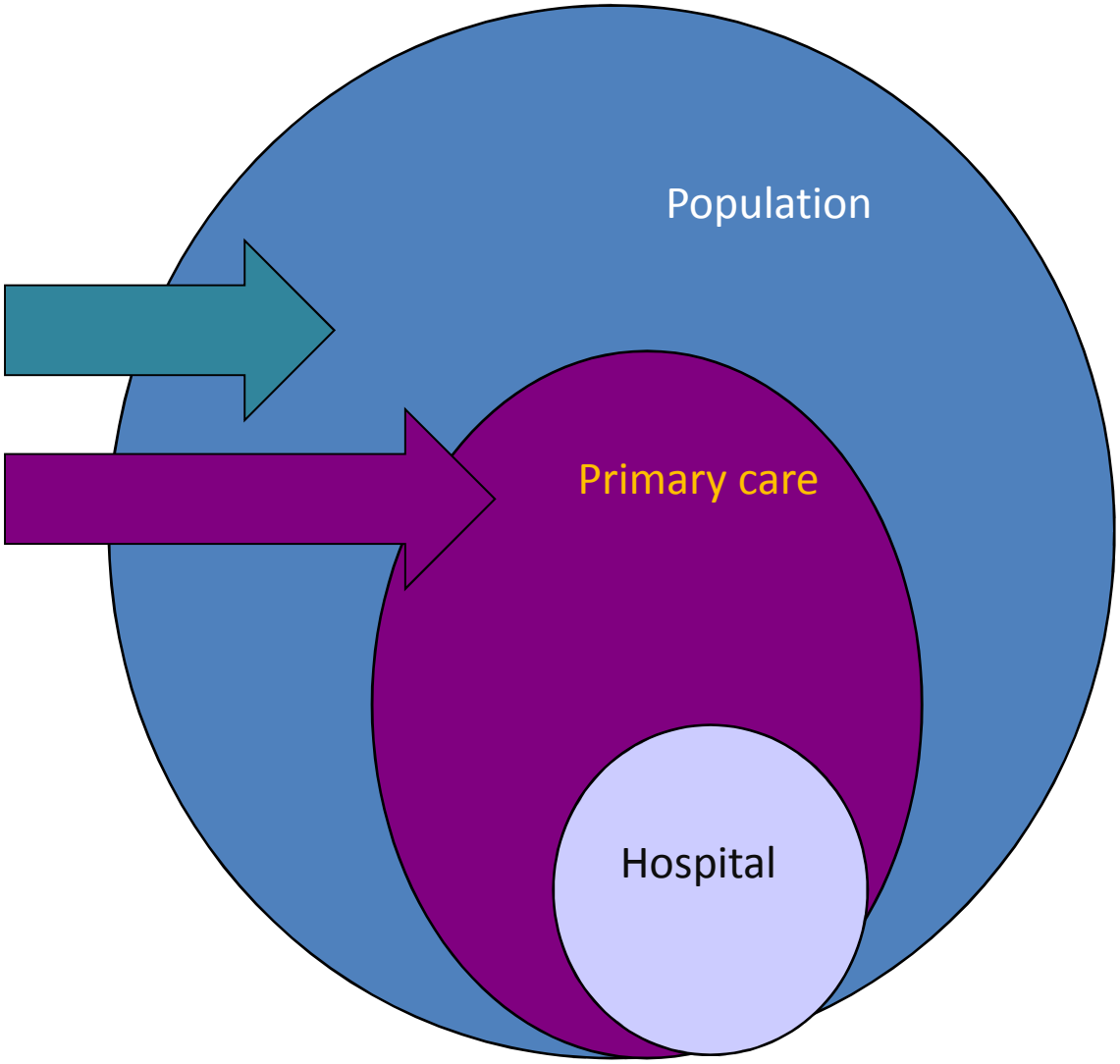


Jarvik et al JAMA 2003

A GP responds to Xray guidelines…

Symptom prevalence is high

but prevalence of serious disease is low



Needle in the haystack

Unnecessary or harmful investigation and diagnosis

Search for diagnosis can be harmful and costly……

Quiz: How many chest x-rays equivalent to lumbar spine series?

- 90 chest x-rays
  20 chest x-rays
  50 chest x-rays
  10 chest x-rays
- Answer is 90 chest x-rays

Royal College of Radiologists 2012

Risk of cancer in new back pain consulters

Among males aged ≥50 consulting in primary care about a new episode of back pain,

prostate cancer will occur in the first year after presentation in

1 in 120

The challenge of diagnostic decisions: I The patient

Histopathology shows changes consistent with prostate cancer which are unlikely to affect life expectancy – **should I have surgery**?

The challenge of diagnostic decisions: II The clinician

CT pulmonary
angiography in patients at risk
identifies
small pulmonary emboli
not seen on
ventilation/perfusion lung scans
– **should I advise**
anticoagulation?

The challenge of diagnostic decisions: III The policy maker

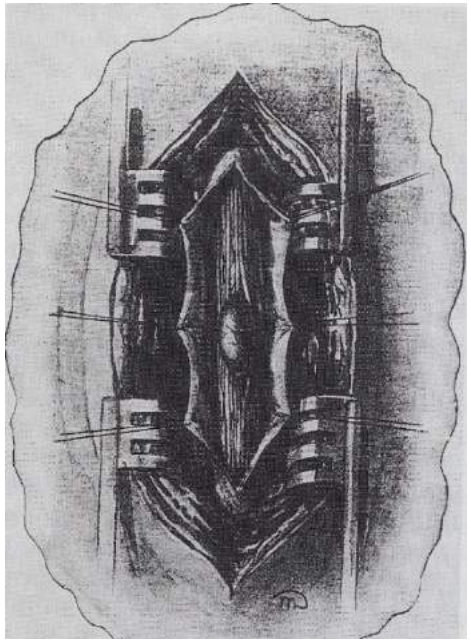
Call for routine MRI scans in people with suspected heart
disease – **should I approve routine use?**

EVIDENCE ON PROGNOSIS IS NEEDED TO HELP DECISION-MAKING

Part 4. PATIENT PROGNOSIS IS DETERMINED BY MORE THAN DISEASE DIAGNOSIS

The legacy of mid-20th century concepts about back pain…….

Main et al 2015



Diagnose and fix underlying spinal pathology

Passive approaches to back pain as a mechanical disturbance

The decline of bed rest

Deyo et al 1986 “people who bed-rest for 2 days rather than 7 days do just as well”

Malmivaara et al 1995 “bed rest is bad for you”

Opioids & overdose

Table 3. Hazard Ratios Between Recent Opioid Doses and Overdose*

Opioid Dose	Patients Who Overdosed, *n*	Person-Years	Overdose Rate (95% CI) per 100 000 Person-Years
None	6	16 780	36 (13–70)
1 to <20 mg/d	22	13 770	160 (100–233)
20 to <50 mg/d	6	2311	260 (95–505)
50 to <100 mg/d	6	886	677 (249–1317)
≥100 mg/d	11	614	1791 (894–2995)
Any opioid use	45	17 582	256 (187–336)

Annals of Internal Medicine | ARTICLE

Opioid Prescriptions for Chronic Pain and Overdose

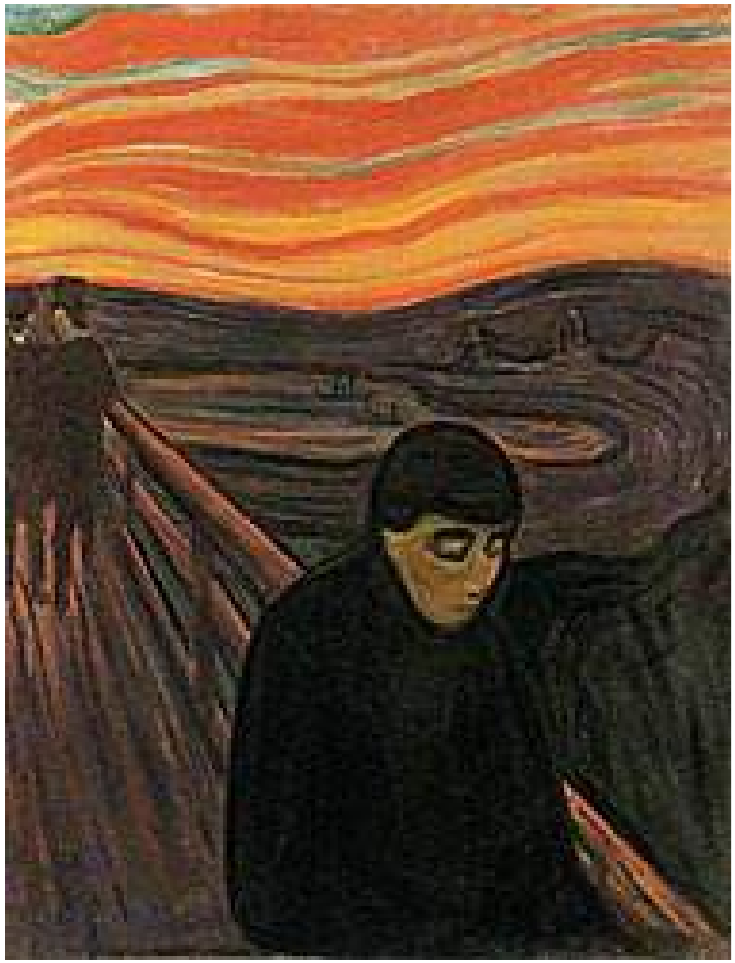
A Cohort Study

Kate M. Dunn, PhD; Kathleen W. Saunders, JD; Carolyn M. Rutter, PhD; Caleb J. Banta-Green, MSW, MPH, PhD; Joseph O. Merrill, MD, MPH; Mark D. Sullivan, MD, PhD; Constance M. Weisner, DrPH, MSW; Michael J. Silverberg, PhD, MPH; Cynthia I. Campbell, PhD; Bruce M. Psaty, MD, PhD; and Michael Von Korff, ScD

Ann Intern Med. 2010;152:85-92.

THE PERSON WITH
THE DISEASE…

NOT
THE DISEASE
WITHOUT THE
PERSON



Why do people with acute low back pain develop persistent chronic low back pain? *(prognostic factors)*

1 Present pain and disability severity

2 Number of pain sites

3 Beliefs, expectations (e.g. catastrophising beliefs)

4 Mood (anxiety, depressive symptoms)

5 Behaviour (e.g. fear avoidance)

6 Environment (work status and demands, family, education and income)

Mallen et al BJGP 2009

Culture and disabling pain

- 12,426 workers in 47 occupational groups across 18 countries
- Disabling LBP prevalence differed up to 8-fold between countries for people doing similar tasks
- Little effect of ergonomic, psycho-social factors or welfare factors

(Coggon et al 2013)

The Biopsychosocial Model

Psychological concepts and approaches:
beliefs, emotions, behaviours
i.e. focus on prognostic factors

Mulitfaceted rehabilitation in a social and occupational context
i.e. shift focus from cure of disease to outcomes important to patient

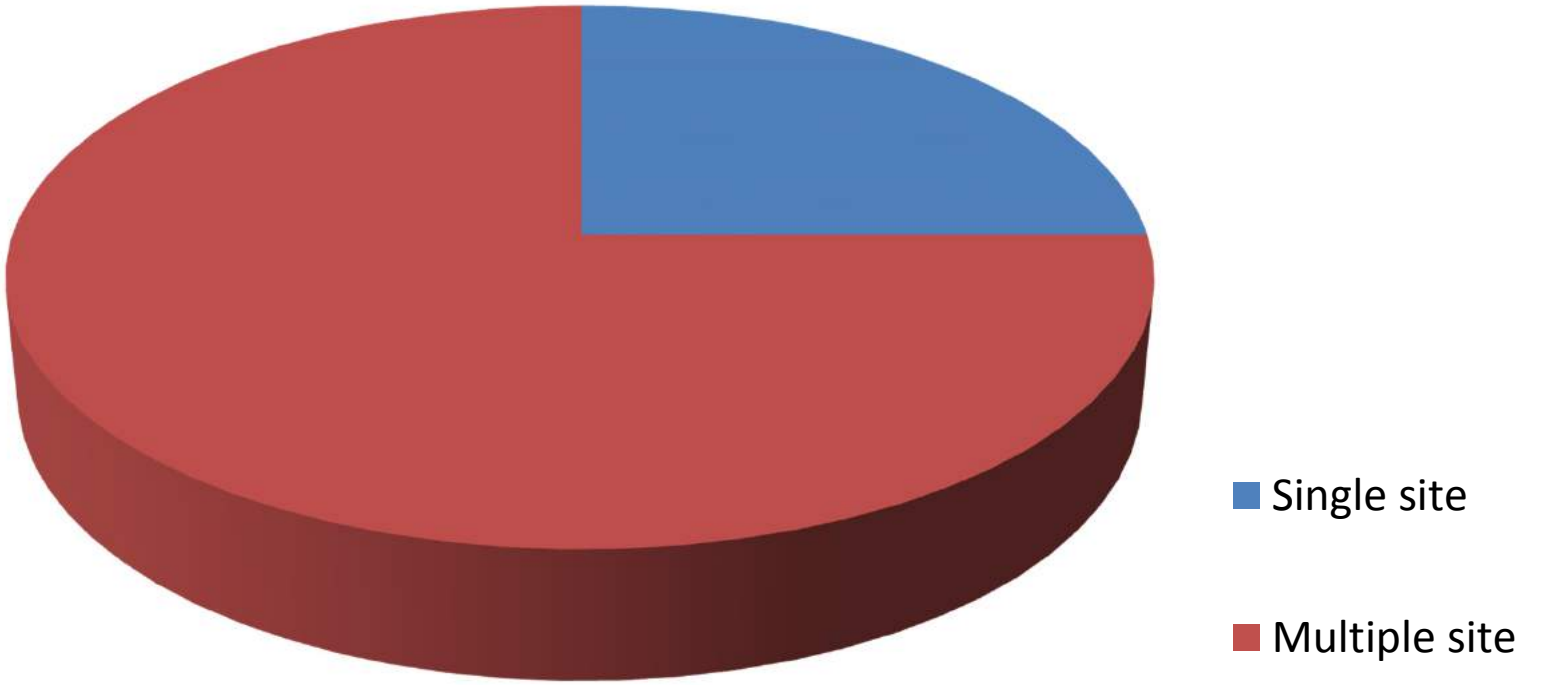
Multidisciplinary rehabilitation

Moderate-to-low evidence for long-term effects on pain, disability, and possibly work

Kamper et al
Cochrane review 2014

Multi-morbidity

Chronic musculoskeletal pain in the general population



Carnes D et al Rheumatology 2007

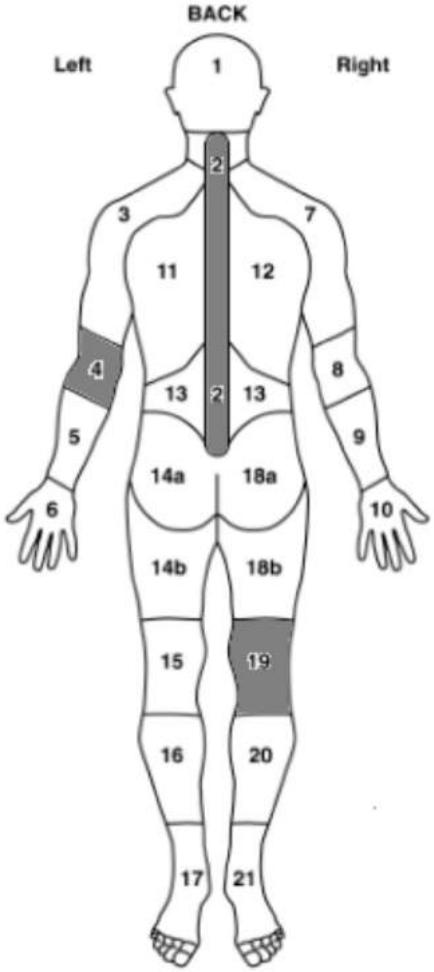
The average person
with chronic low back pain has
multimorbidity

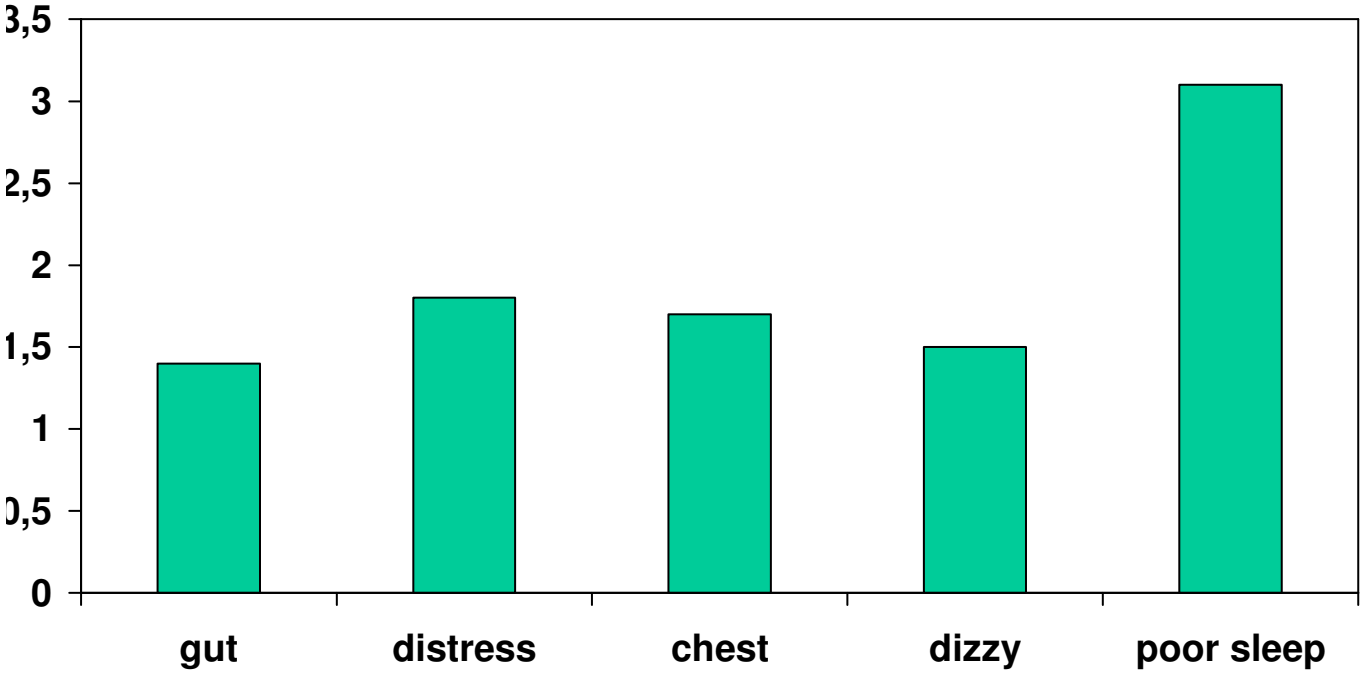
EFFECT OF GENERALISED PAIN ON OUTCOME OF LOCAL PAIN

Low back pain only	1.0
Low back pain plus pain elsewhere	6.4

Thomas E et al *BMJ* 1999

Multiple pains are more than just pain





Rohrbeck et al., 2007

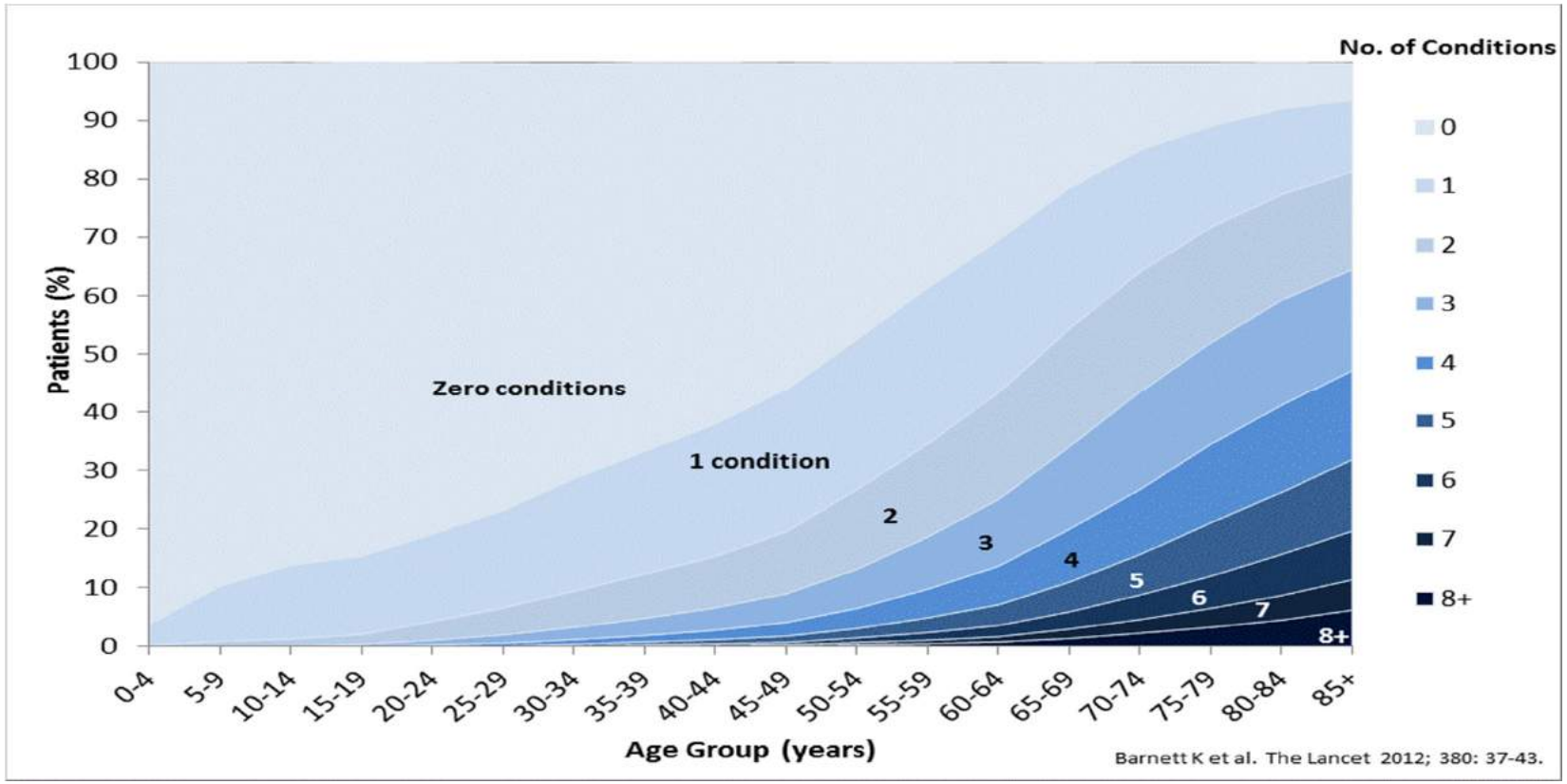
MULTIMORBIDITY

In the top quartile of older patients at risk of hospitalisation,

- chronic pain due to osteoarthritis
- depression

are the most frequent comorbidities

Freund et al 2012


No. of Conditions
0
1
2
3
4
5
6
7
8+
Patients (%)
100
90
80
70
60
50
40
30
20
10
0
Zero conditions
1 condition
2
3
4
5
6
7
8+
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age Group (years)
Barnett K et al. The Lancet 2012; 380: 37-43.

Evidence about optimal treatment of people and conditions

- *Katon et al. NEJM 2010.* Collaborative care for multiple chronic diseases
- Depression and disease and general health outcomes all improve

Evidence about optimal treatment of people and conditions

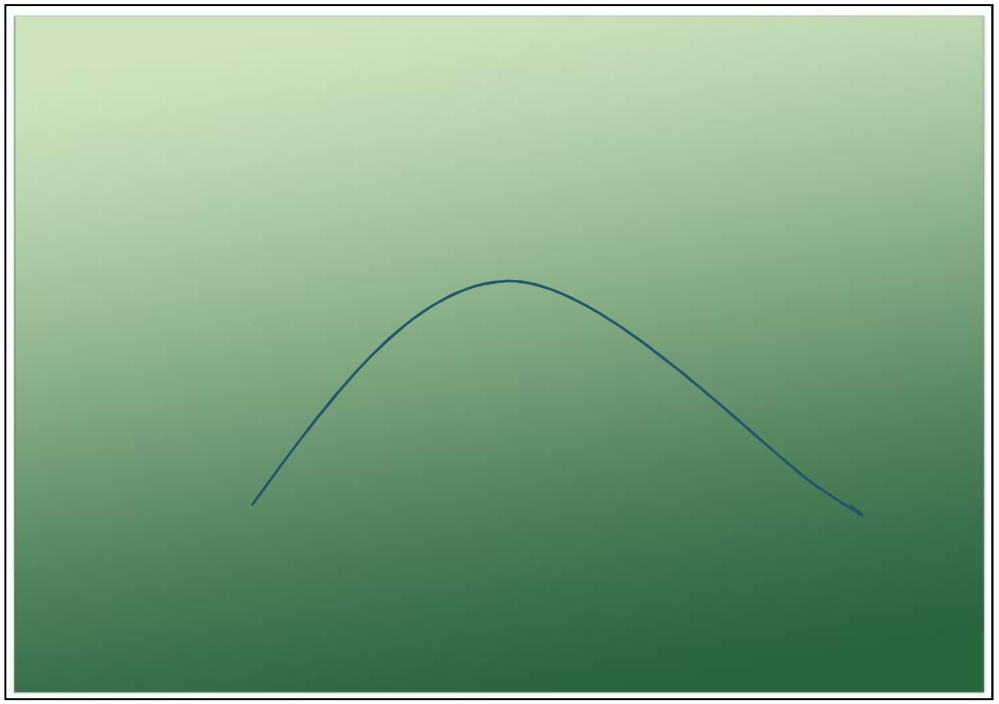
- *Katon et al. NEJM 2010.* Collaborative care for multiple chronic diseases

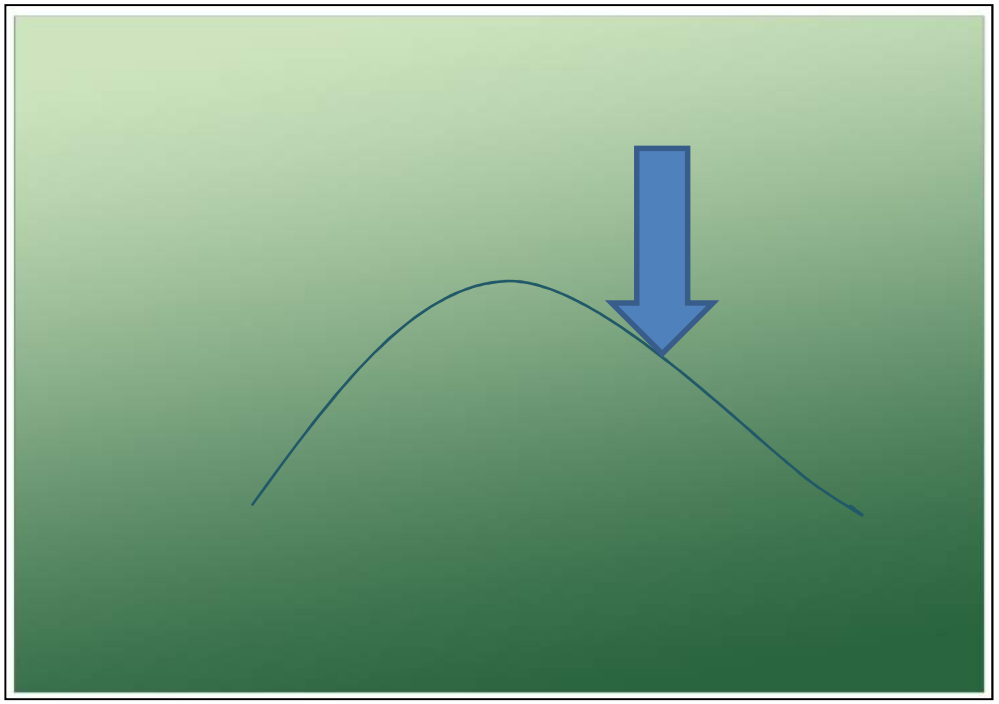
Prognosis is about the sick person

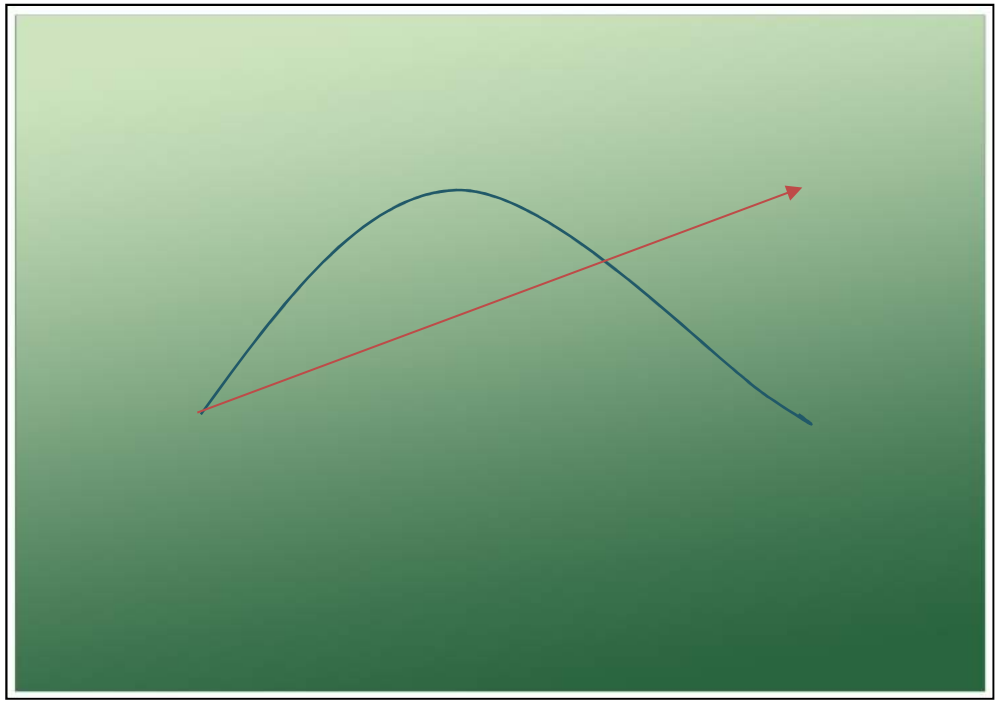
Part 5. NOT “HAVE YOU GOT IT?” BUT “HOW MUCH HAVE YOU GOT?”

Diseases you have or not?

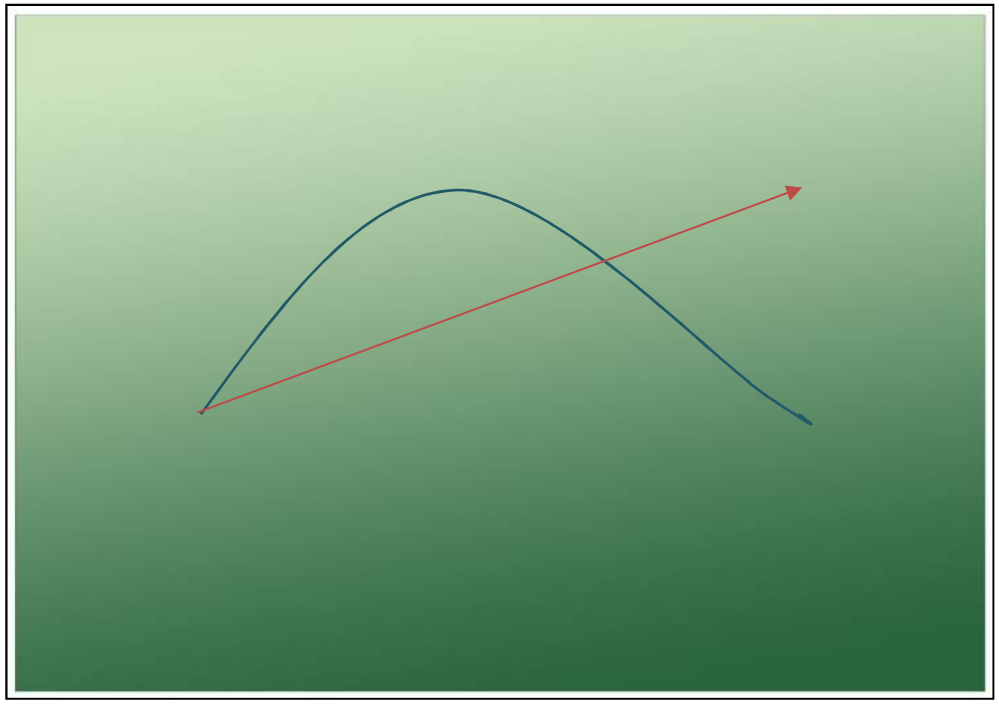
- Diabetes
- Asthma
- Hypercholesterolaemia
- Hypertension



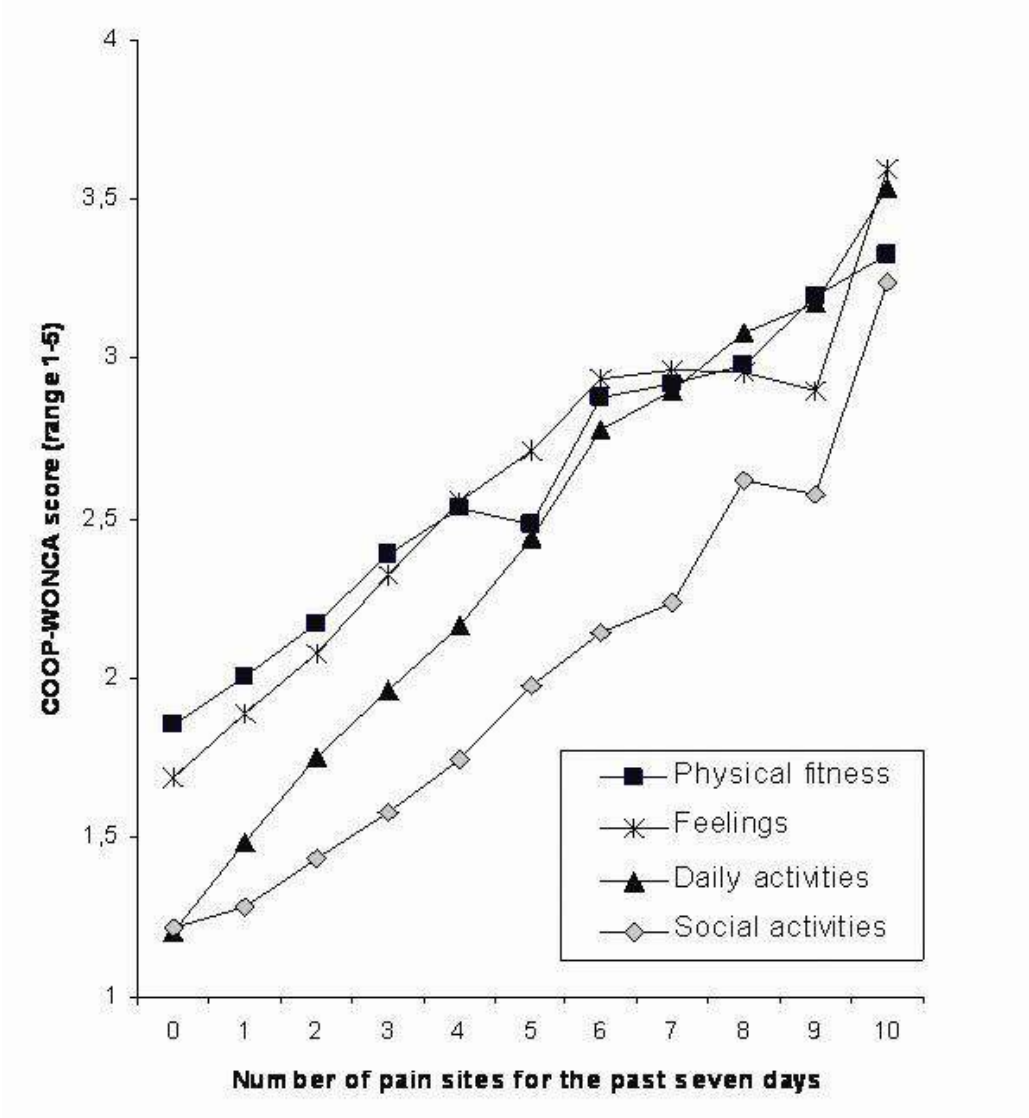




The person with multiple prognostic factors



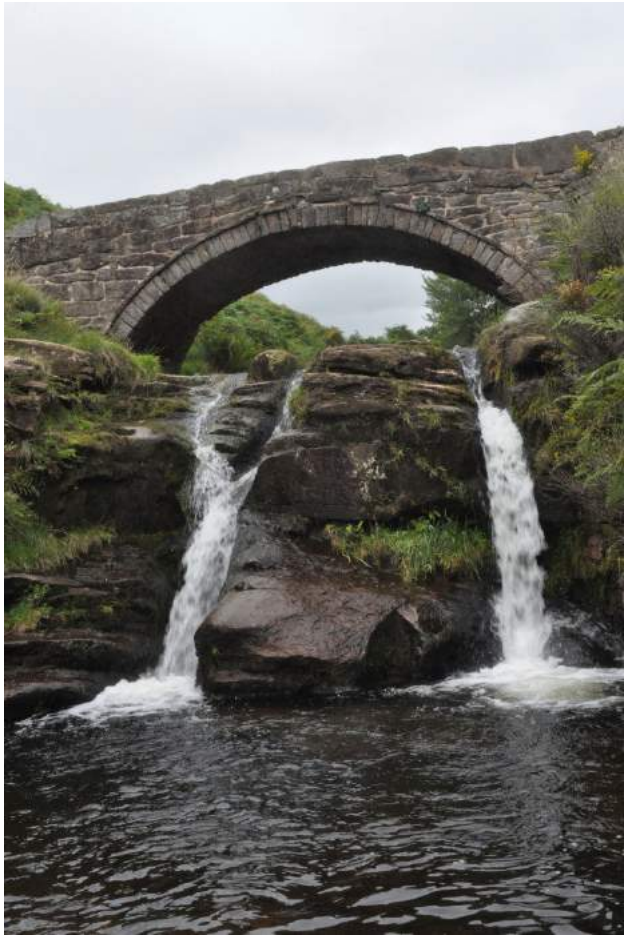
Number of PAIN SITES as prognostic factor



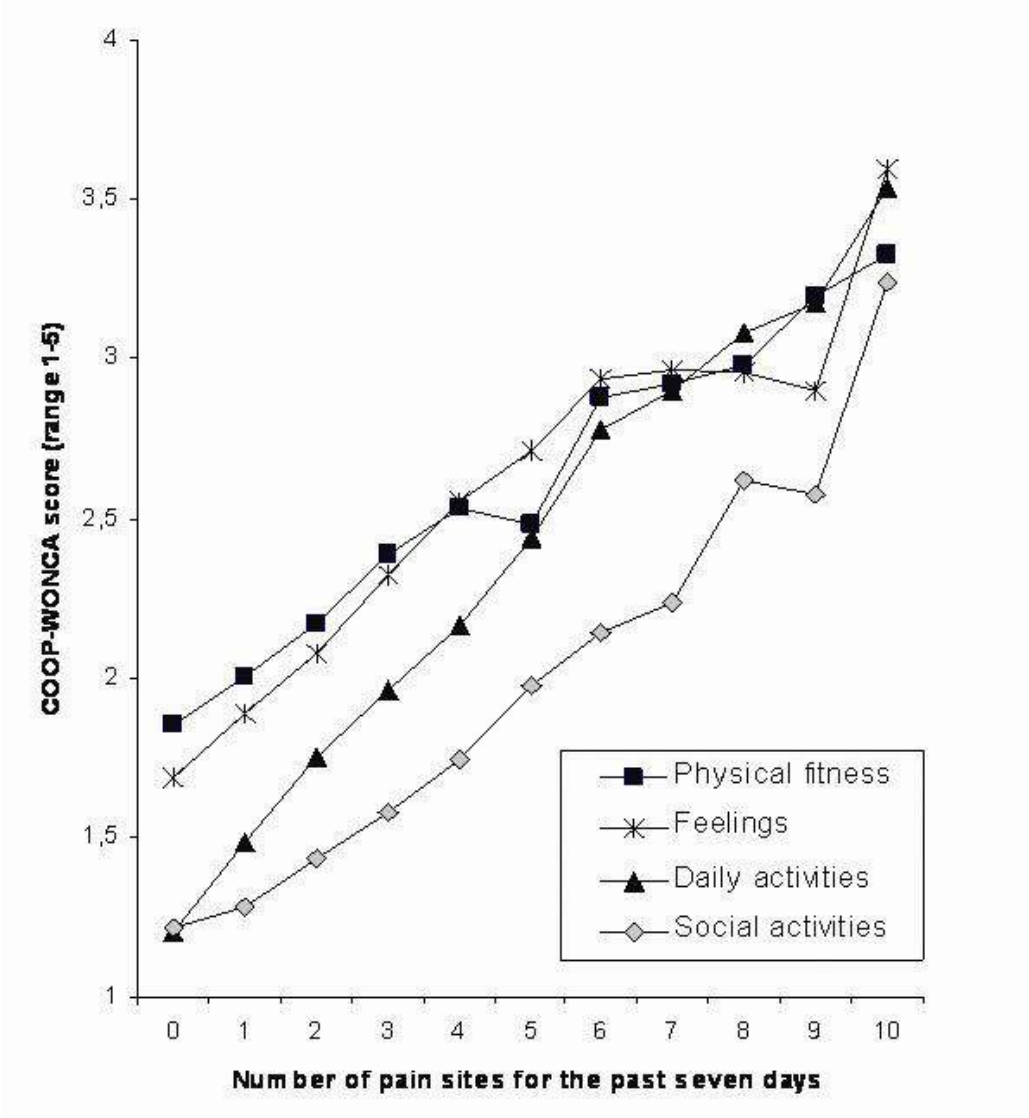
Kamaleri et al
Eur J Pain 2008

So…can we abandon diagnostic labelling and think in probabilities for the individual patient?

Part 6. THE PROS AND CONS OF DISEASE LABELLING

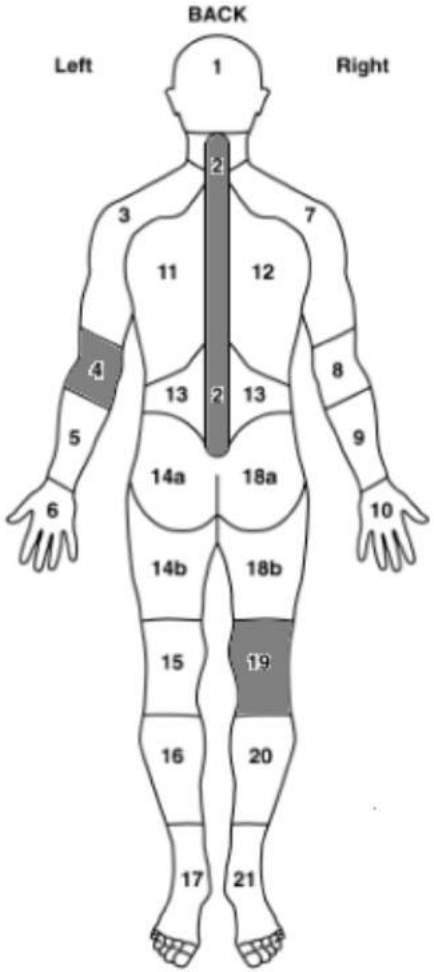


Number of PAIN SITES as prognostic factor



Kamaleri et al
Eur J Pain 2008

Chronic Widespread Pain Defined



“Fibromyalgia is simply a label to use when patients have chronic, unexplained diffuse pain”

Goldenberg 1999

WHAT THE PATIENTS SAY I

“The relief when my doctor told me I had fibromyalgia was, well, huge”

“Someone believed me, and understood what I was suffering”

“Here was a diagnosis at last… proper recognition and the possibility of a proper treatment or even a cure”

WHAT THE PATIENTS SAY II

"If they had told me at the start that there might not be a diagnosis to make, it would have been far better……."

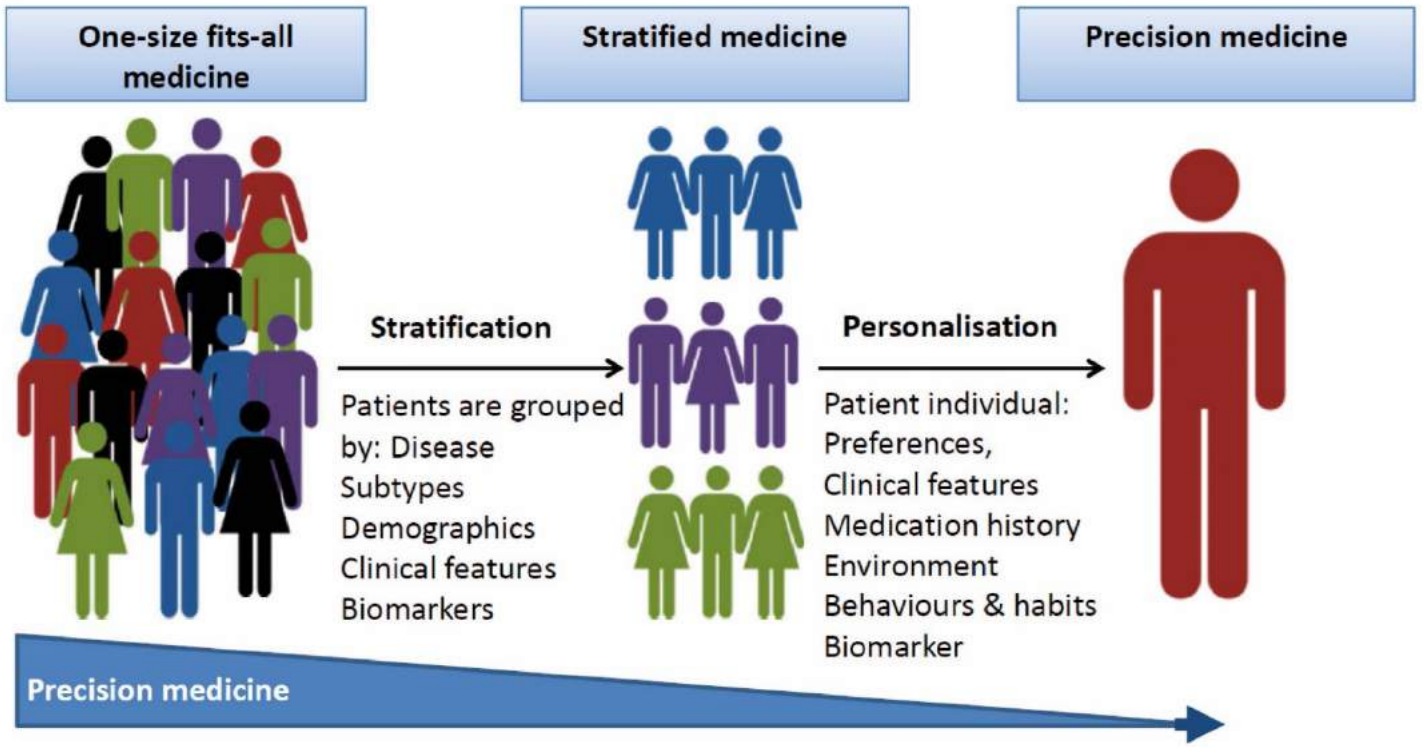
Young secretary with bilateral wrist pain speaking at Pain Summit, London

….we (patients, public, physicians, researchers)
are not so good at using probabilities in practice when decisions are to be made
– better for big-scale policy than at individual level

Part 7. PROGNOSIS – A NATURAL FRAMEWORK FOR MODERN CLINICAL PRACTICE

Tackling prognostic variability with modern science and technology

- PRECISION MEDICINE: A new genetic biomarker identifies a group of patients with malignant melanoma with a poor prognosis but a potential target for novel treatment



Stratified medicine: tailoring care to a **subgroup of patients** with disease

Precision medicine aims to maximise the probability of curing a disease or ailment whilst minimising side effects of interventions in **individual patients**

Manchester Precision Medicine Institute

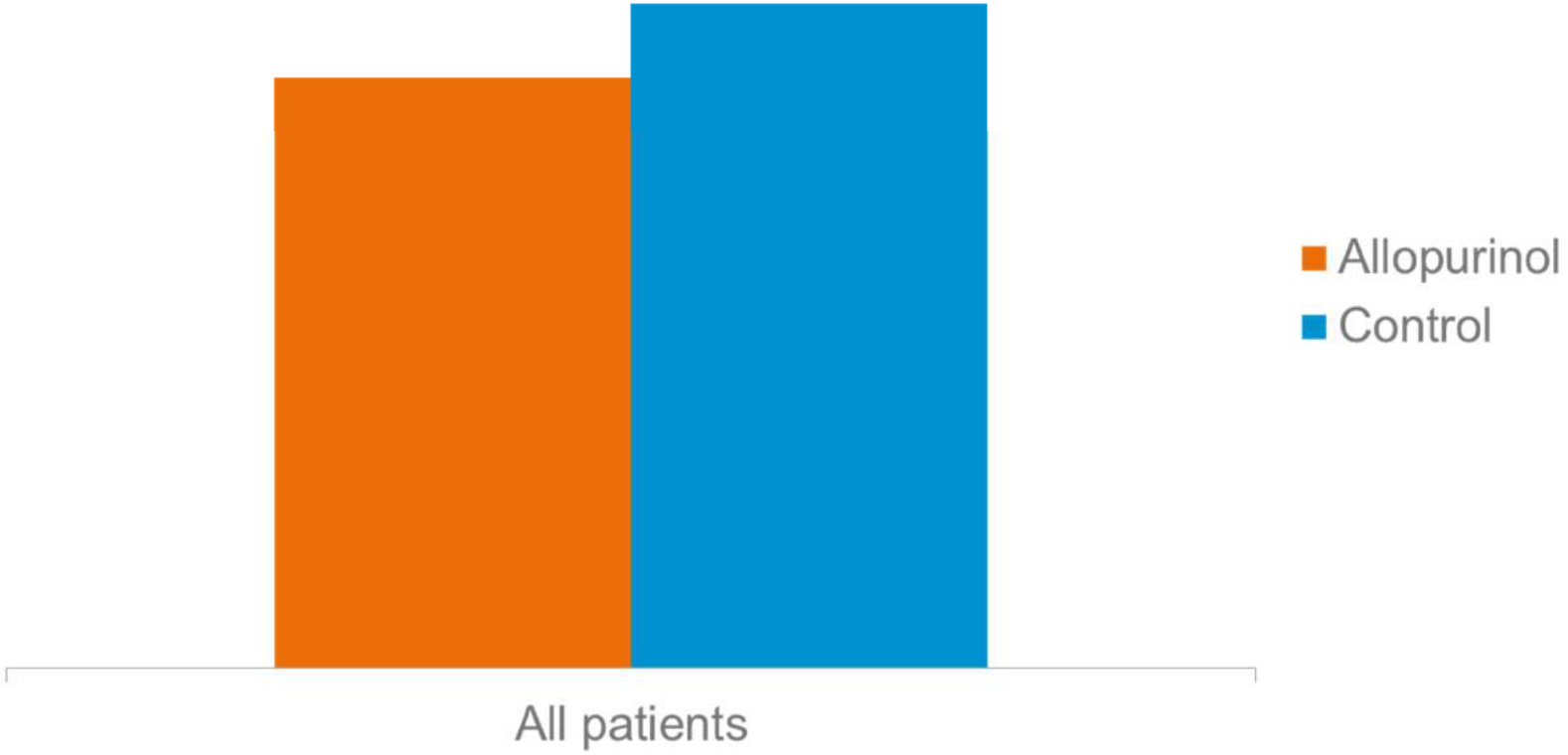
Tackling prognostic variability with modern science and technology

- BIG DATA: Much more information, updated constantly, developing and delivering instant prognosis for the individual patient using machine learning techniques.

Two meanings of Big Data

- Using large datasets from routine health and social care and other sources

All-cause mortality in gout patients: those started on allopurinol versus controls



Dubreuil M et al 2014

Two meanings of Big Data

- Using new machine learning techniques

Prediction of In-hospital Mortality in Emergency Department Patients With Sepsis: A Local Big Data-Driven, Machine Learning Approach.

Taylor RA[1], Pare JR[1], Venkatesh AK[1], Mowafi H[1], Melnick ER[1], Fleischman W[1], Hall MK[1]

Quick to develop
Large number of variables
Updated in real time
Generalisable

BUT: are they useful and do they improve outcomes?

BUT…….
how easy is it to change?

The Challenges of the Old Culture

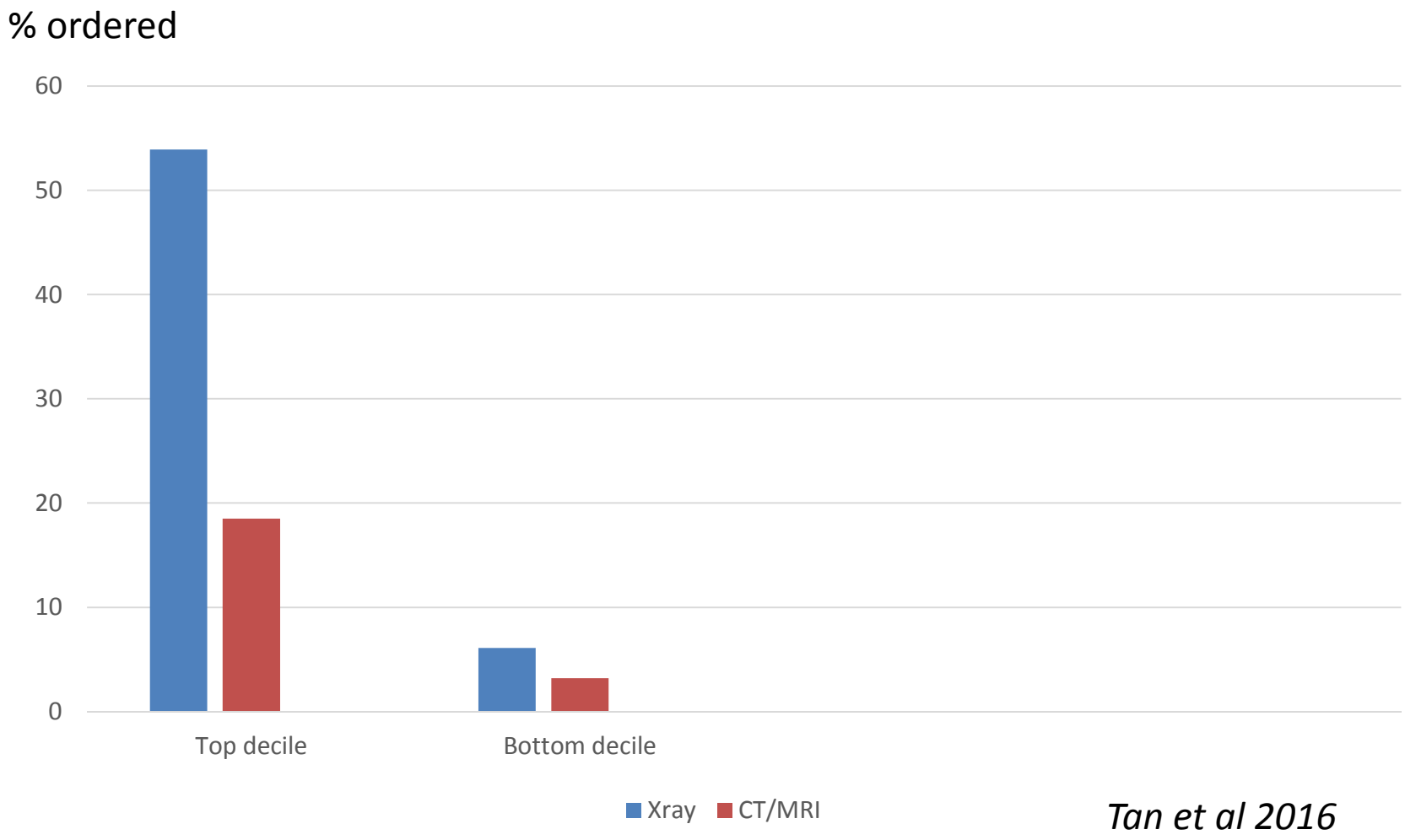
The example of imaging

Between 2000 and 2010:

Xrays stable at 17%
MRI/CT increased from 7.2 to 11.3%

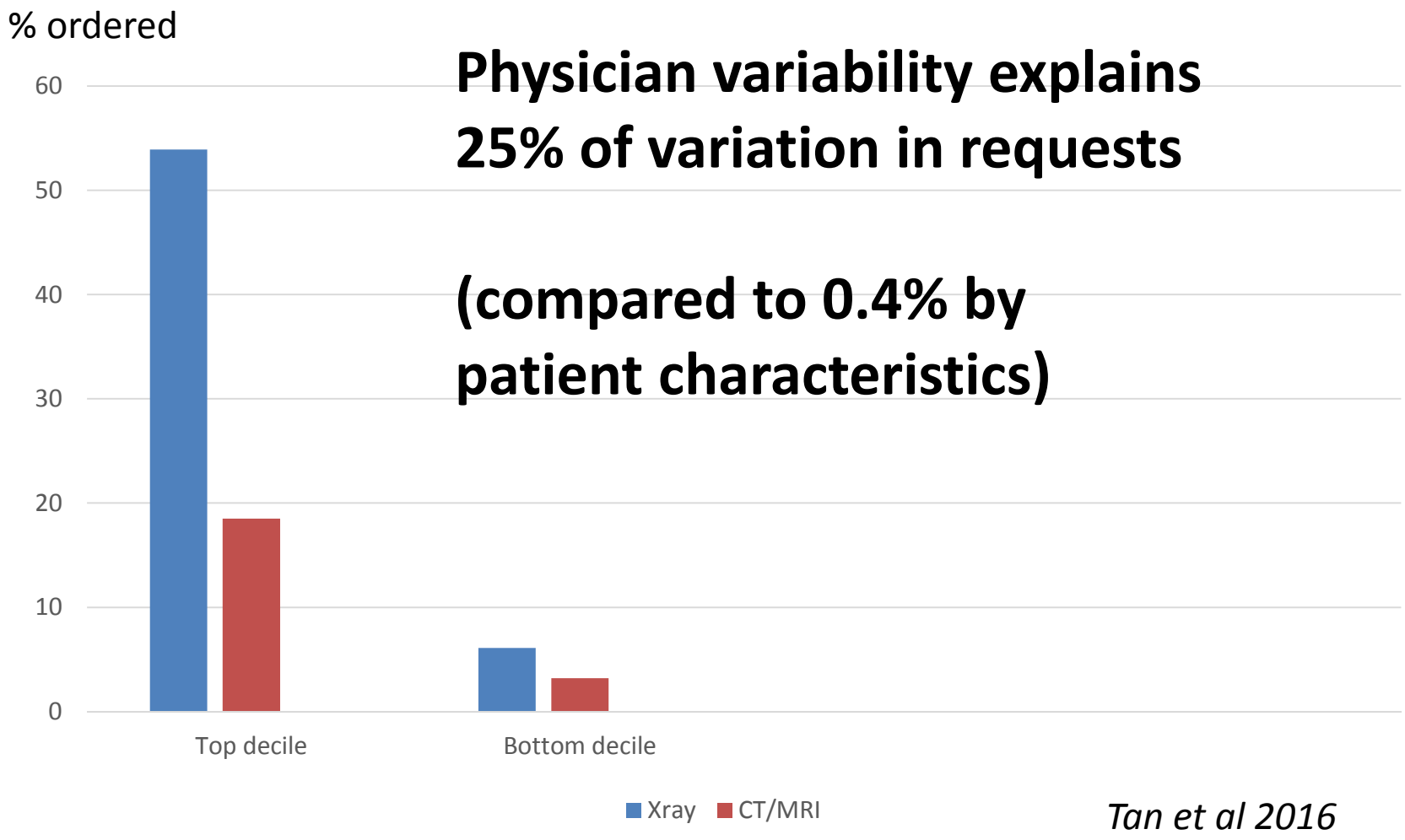
Mafi et al 2013

Primary care physicians' use of imaging



Tan et al 2016

Primary care physicians' use of imaging



Physician variability explains 25% of variation in requests

(compared to 0.4% by patient characteristics)

Tan et al 2016

- Half of patients expect imaging *(Jenkins et al 2016)*
- Some forms of clinician education (e.g. decision support) lower requests *(Jenkins et al 2015)*
- See a chiropractor or a physical therapist first and reduce use of imaging by 70 percent with no referrals *(Fritz et al 2015)*

The Promise of the New Prognosis

Stratified care

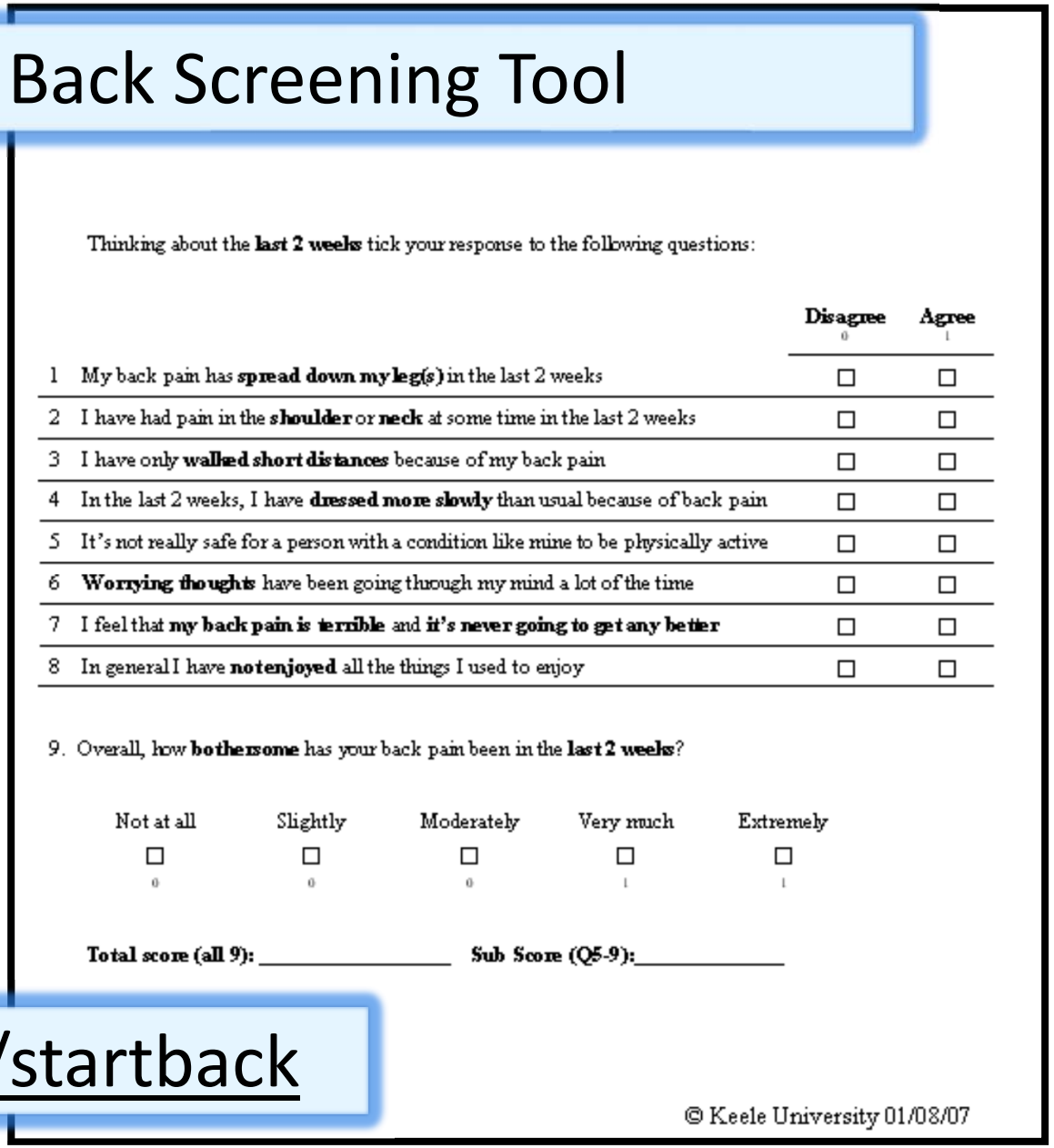
- Prognostic information identifies people at different levels of risk for poor outcome
- Treatment is selected EITHER
  - To provide targeted treatment only relevant to specific risk groups

  OR
  - To provide more efficient care with cost-benefit advantages

The STarT Back Screening Tool

Items:

- Referred leg pain
- Comorbid pain elsewhere
- Disability
- Fear avoidance
- Anxiety
- Catastrophising
- Depression
- Overall impact



Thinking about the **last 2 weeks** tick your response to the following questions:

		Disagree (0)	Agree (1)
1	My back pain has **spread down my leg(s)** in the last 2 weeks	☐	☐
2	I have had pain in the **shoulder** or **neck** at some time in the last 2 weeks	☐	☐
3	I have only **walked short distances** because of my back pain	☐	☐
4	In the last 2 weeks, I have **dressed more slowly** than usual because of back pain	☐	☐
5	It's not really safe for a person with a condition like mine to be physically active	☐	☐
6	**Worrying thoughts** have been going through my mind a lot of the time	☐	☐
7	I feel that **my back pain is terrible** and **it's never going to get any better**	☐	☐
8	In general I have **not enjoyed** all the things I used to enjoy	☐	☐

9. Overall, how **bothersome** has your back pain been in the **last 2 weeks**?

Not at all	Slightly	Moderately	Very much	Extremely
☐	☐	☐	☐	☐
0	0	0	1	1

Total score (all 9): _____ **Sub Score (Q5-9):**_____

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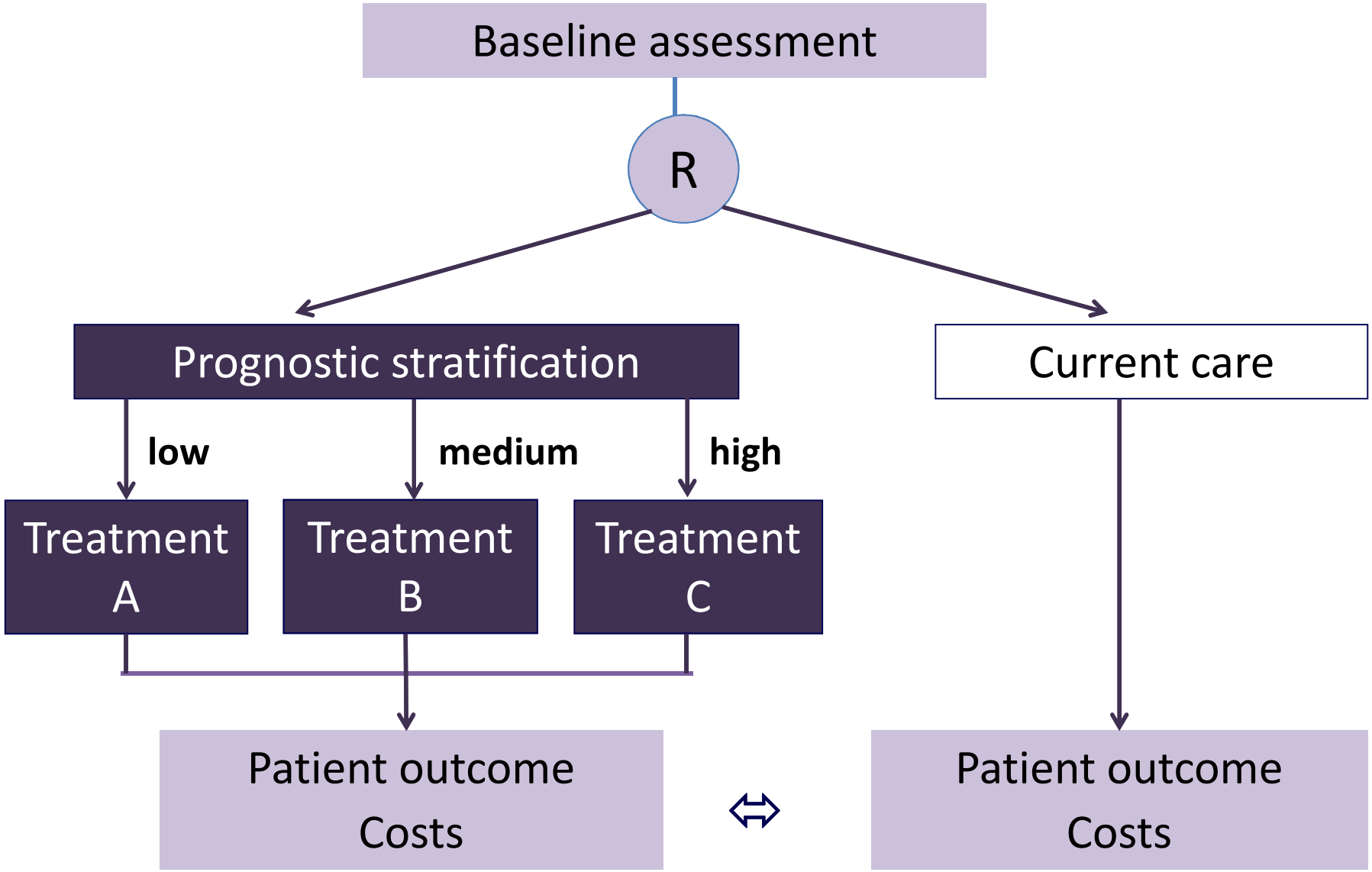
www.keele.ac.uk/startback

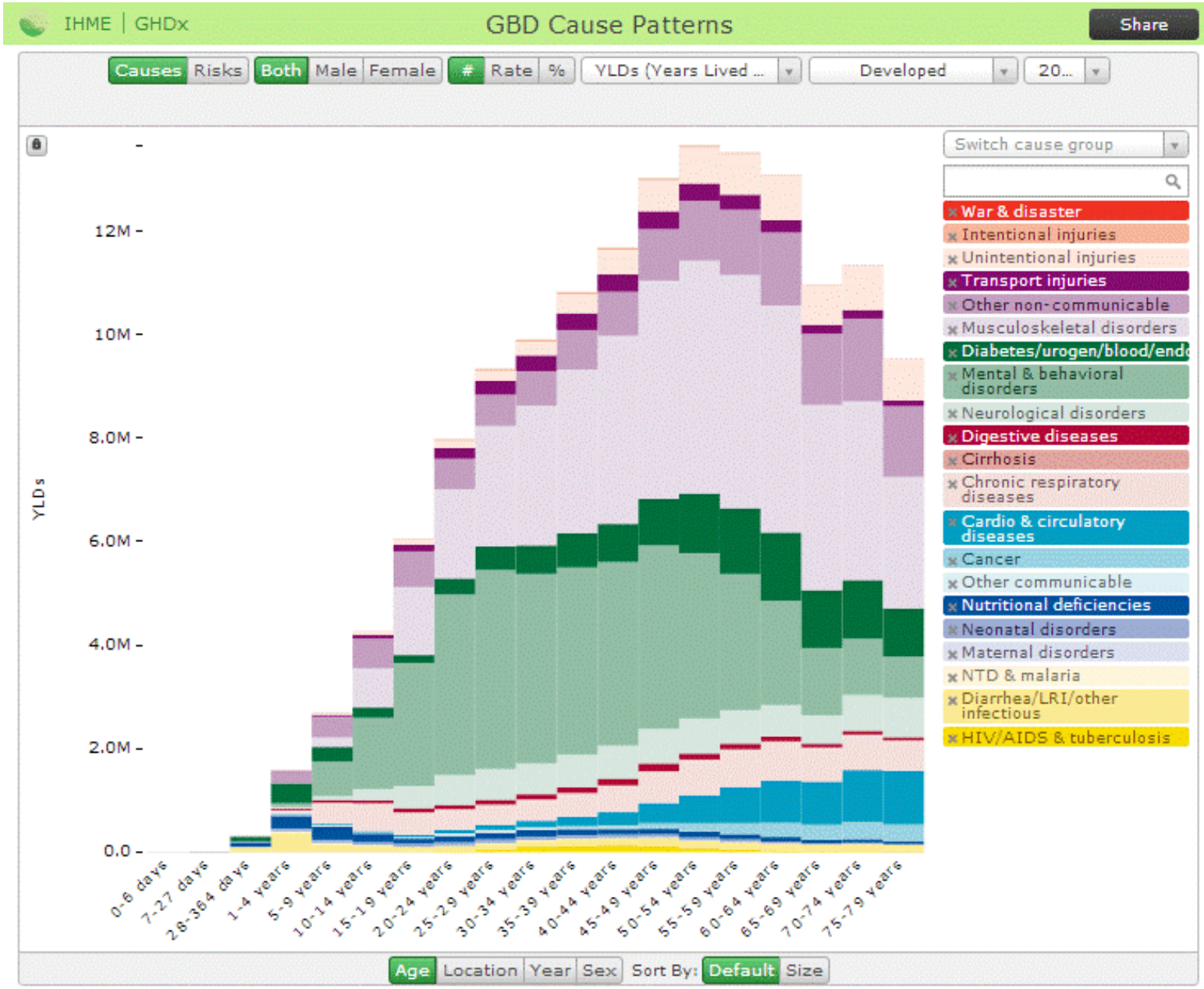
Hill et al. 2008; Hay et al. 2008

Impact of using prognostic information



The Promise of PRIMARY PREVENTION

Everyone has a prognosis….



Institute for Health Metrics and Evaluation GBD 2010, released 3/2013 © 2014 University of Washington

SOME ITEMS FOR A BIOPSYCHOSOCIAL POPULATION STRATEGY

- Physical activity, weight control
- Mental well being

- Childhood ill-health and adverse experiences
- Education (Hagen et al; Dionne et al)
- Work environment
- Material environment, social inequality

The example of exercise

Exercise and activity benefits
acute and chronic low back pain

Chou et al 2016

The example of exercise

1-point increase in physical activity score
in middle-aged women
equals
10% reduction in risk of significant pain
three years later

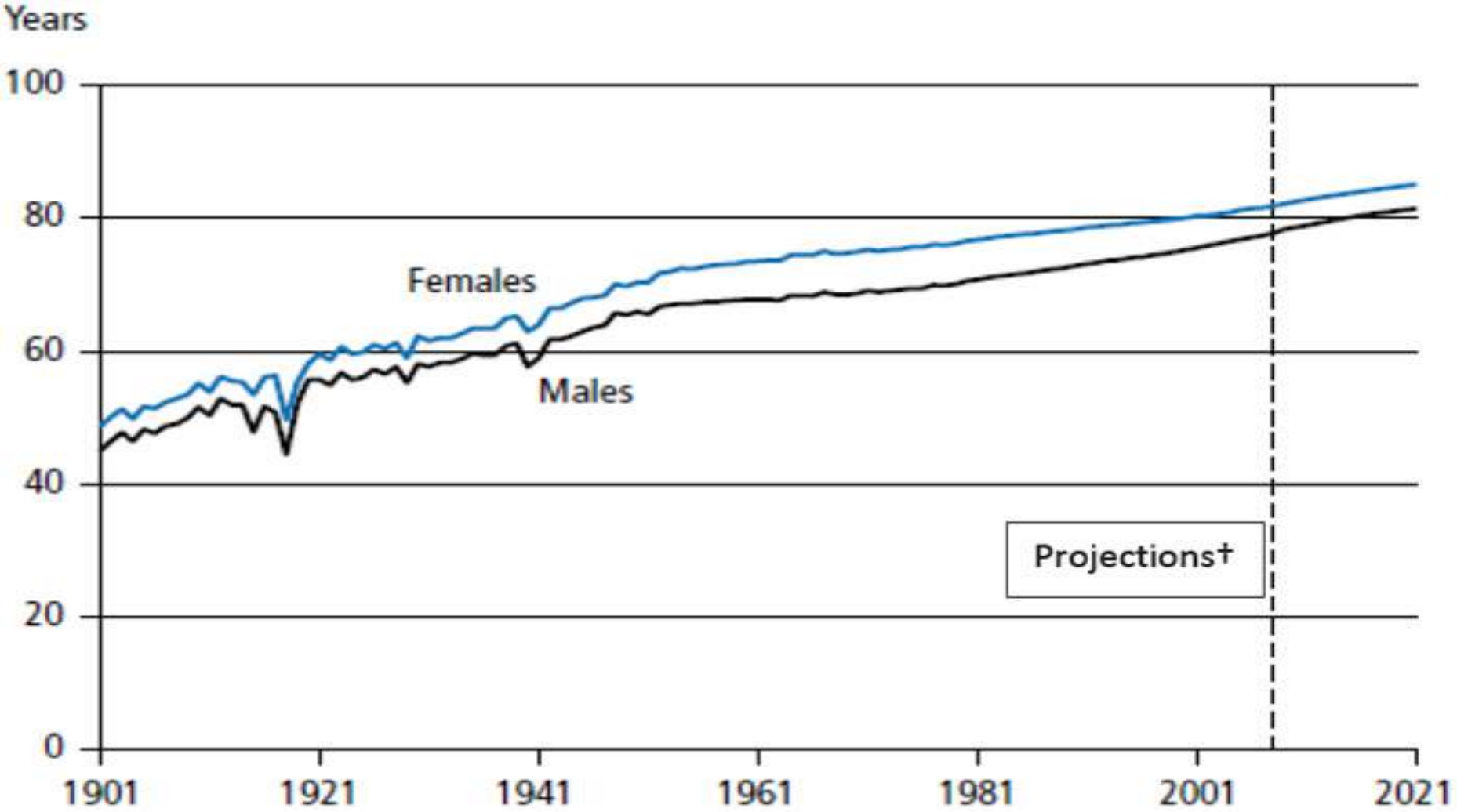
Dugen et al 2009

The example of exercise

In 70-103 year olds,
strenuous physical activity
protected against
future low back pain

Hartvigsen and Christensen 2007

Life expectancy at birth 1901-2021



Source: Social Trends 40: 2010 edition, Office for National Statistics