



PROF
RICK BODY
@richardbody

DIAGNOSTICS IN **EVOLVING CARE MODELS**

for Emergency Medicine



EMERGENCY MEDICINE

CROWDING



LIVERPOOL ECHO, MARCH 2016



Mirror

Sun

HOLDS

Express

NHS hits breaking point

HOSPITALS GO INTO MELTDOWN

OUR NHS DYING

RITA

Reel viewers stick their Ora in

Wild boar kills M4 motorist

FROM £9.50

BOOKING FORM INSIDE

\$98bn NHS BUDGET BUT...

THIRD WORLD A&E

10 hospitals in crisis
Worst wait in 10yrs
Car park care tent

DAILY EXPRESS

PAMPERED SPORTS STARS WHO DON'T KNOW HOW TO MAKE A CUP OF COFFEE

DAILY MAIL

NATURAL CAUSES BY JAMES OSMALD FOR £1

FROM REPORT FROM A TOP DOCTOR ON THE NHS

HOSPITALS JUST CAN'T COPE



Most inspiring Fast Diet success stories ever

THE CRISIS WORST FOR TEN YEARS

2 Fashion must-haves

Helping blunder led to melt

METRO

MAYNE MANIA

KRISTEN SO CLOSE TO GAL PAL

11-hour wait for 999 ambulance

A&E crisis is the worst in a decade

Patients treated in car park tents

Cameron

CHEST PAIN

The **most** common reason
for emergency hospital
admission



Just

1 in 5



admitted for investigation

actually has ACS

YESTERDAY'S DIAGNOSTICS **ADMIT FOR TESTS**



Image: Royal Berkshire NHS Trust in the 1930s

HS-TROPONIN ON ARRIVAL: **PROBABILITY OF AMI**

NEGATIVE: **4%**

POSITIVE: **52%**

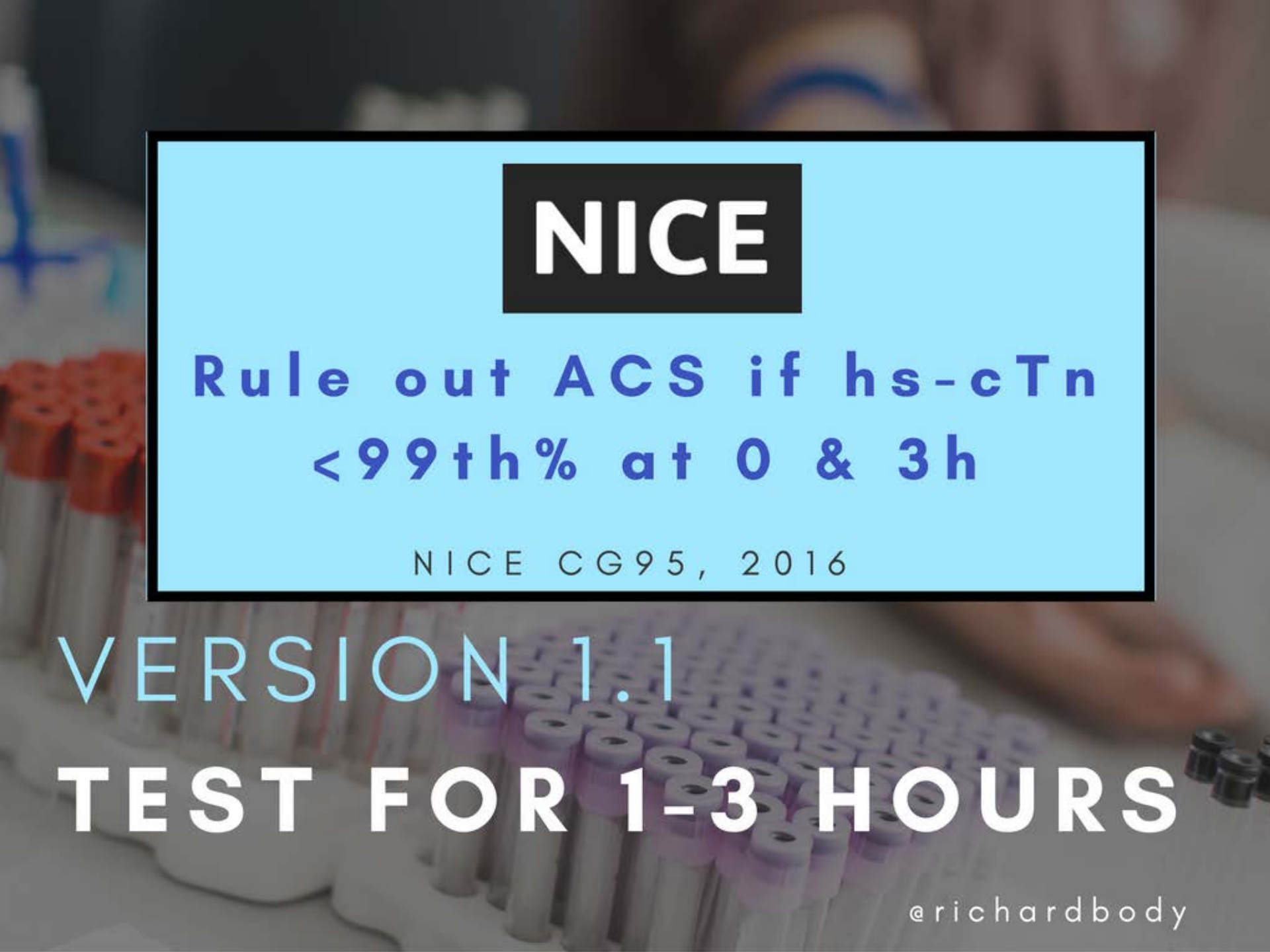
Ref: Body, JACC 2011; 58(13): 1132-9



VERSION 1.1

TEST FOR 1-3 HOURS

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NICE

Rule out ACS if hs-cTn
< 99th% at 0 & 3h

NICE CG95, 2016

VERSION 1.1

TEST FOR 1-3 HOURS

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VERSION 1.2

ONE TEST RULE OUT!

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HS-cTnT <5ng/L
& no ECG ischaemia

 *37% ruled out*

SENSITIVITY 99.1%, NPV 99.6%

VERSION 1.2

ONE TEST RULE OUT!

What should
future
diagnostics
look like?



A blue and white racing car and a red sports car are driving on a track. The blue car is on the left, and the red car is on the right. They are both moving towards the right side of the frame. The background is a blurred track with a guardrail.

FAST

- HERB CAEN

*"I sometimes worry
about my short attention
span, but not for long"*



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ACCURATE

Minimize false negatives AND false positives

SIMPLE

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"As simple
as possible,
**but no
simpler**"

- ALBERT EINSTEIN

MACS

Body et al, Heart 2014; 100: 1462-8



Algorithm:

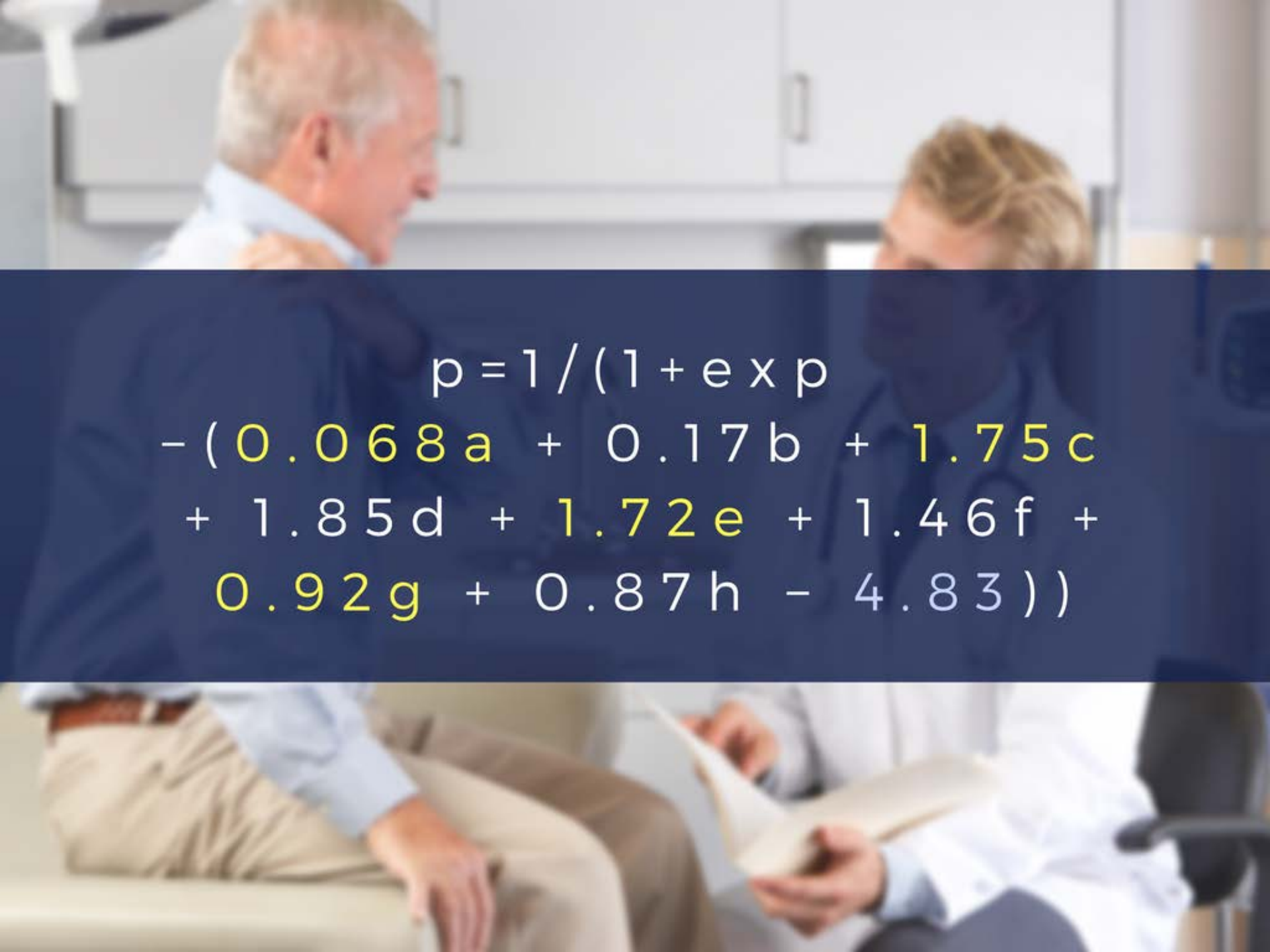
History +

ECG +

Biomarkers



CALCULATES
EACH
PATIENT'S
PROBABILITY
OF ACS


$$p = 1 / (1 + \exp(-(0.068a + 0.17b + 1.75c + 1.85d + 1.72e + 1.46f + 0.92g + 0.87h - 4.83)))$$

HS-TROPONIN ON ARRIVAL: **PROBABILITY OF AMI**

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Ref: Body, JACC 2011; 58(13): 1132-9

HS-TROPONIN ON ARRIVAL: PROBABILITY OF AMI

<3ng/L: **0%**

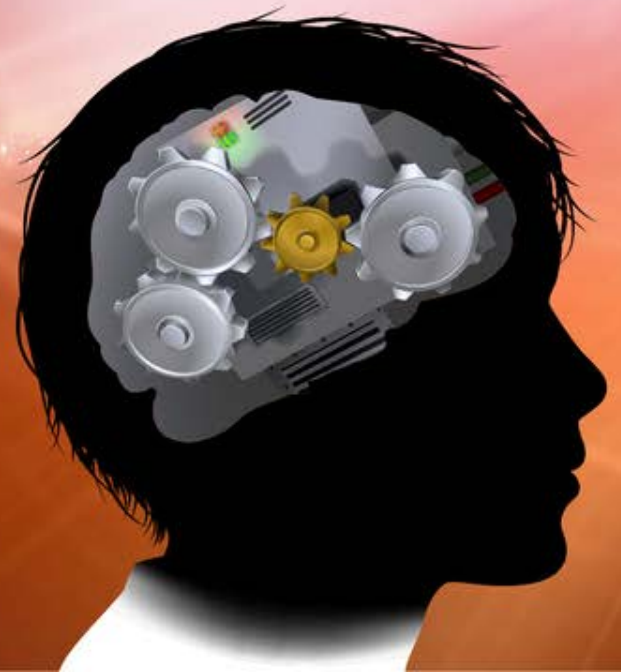
3-14ng/L: **6%**

14-50ng/L: **27%**

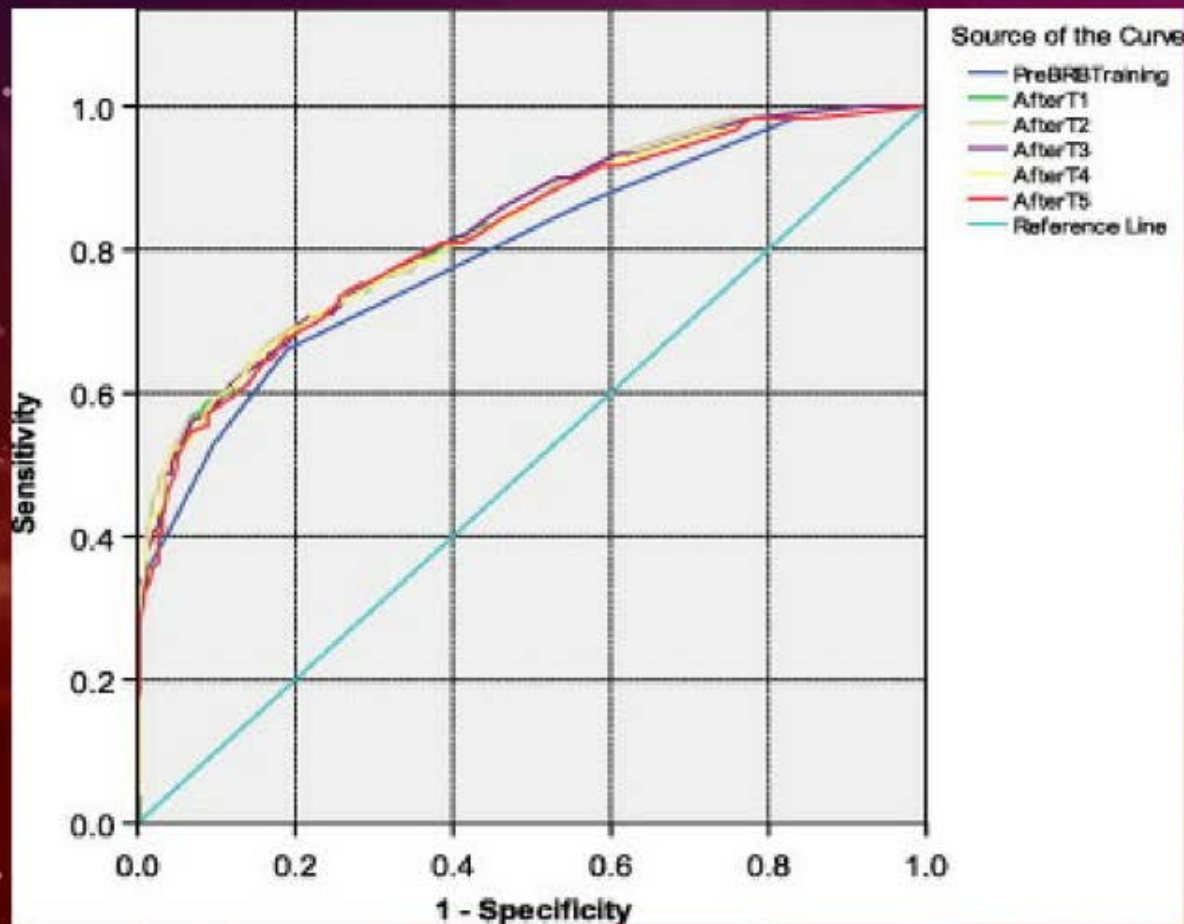
50-100ng/L: **92%**

>100ng/L: **100%**

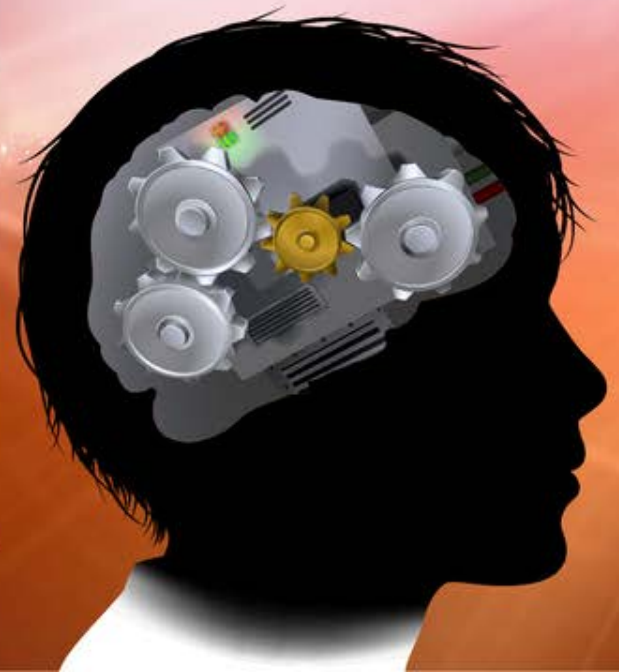
MACHINE LEARNING



MACHINE LEARNING



Kong et al, Eur J Operat Res 2012; 219; 564-73



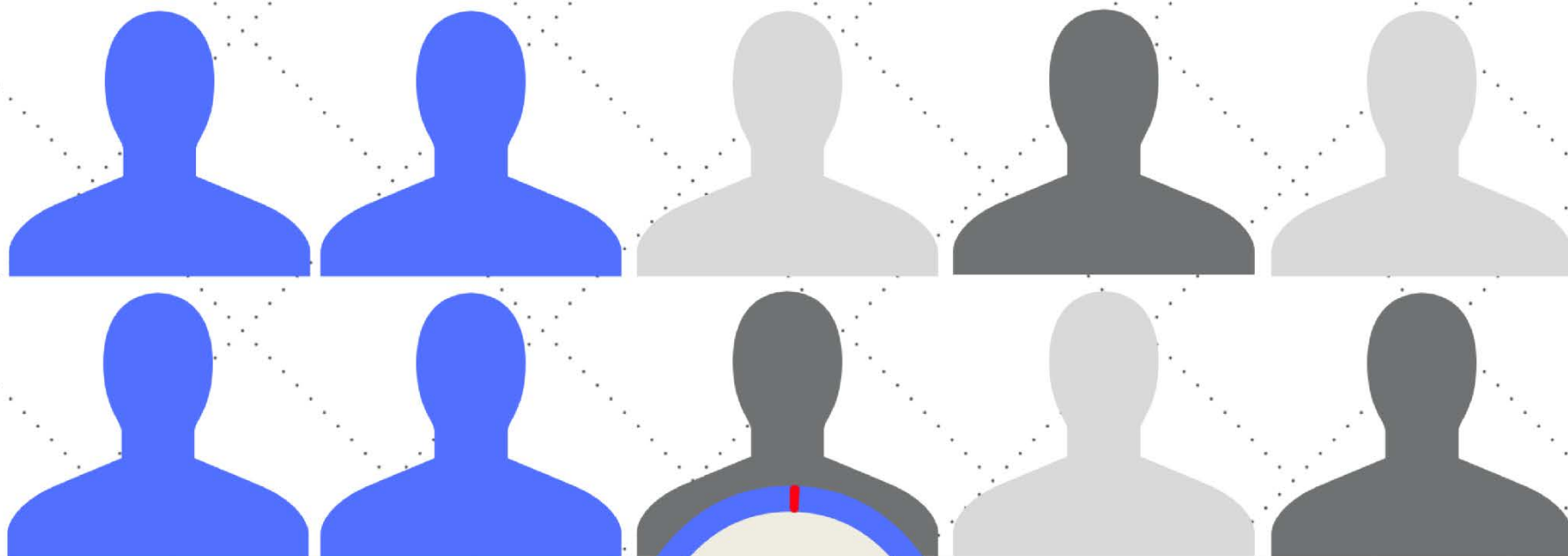
UNCERTAINTY



A person is shown from behind, jumping off a steep, rocky cliff edge. They are wearing a blue jacket, blue jeans, a black cap, and a backpack. Their arms are outstretched forward. Below them is a vast valley with a winding river, a large lake, and a small town. The sky is clear and blue.

HOW MUCH
RISK
IS TOO
MUCH?

JUST
4 IN 10
DOCTORS



would accept a

1%

risk of missing ACS

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A photograph showing a male doctor in a white lab coat and a dark tie, leaning over a desk to show a tablet to an elderly male patient. The patient is wearing a light blue short-sleeved shirt. They are in a clinical setting with a computer monitor and a stethoscope on the desk. A yellow horizontal bar is positioned above the text, and a dark blue horizontal bar is positioned below the text.

SHARED DECISIONS



Of every 100 people like you
who come to the Emergency
Department:

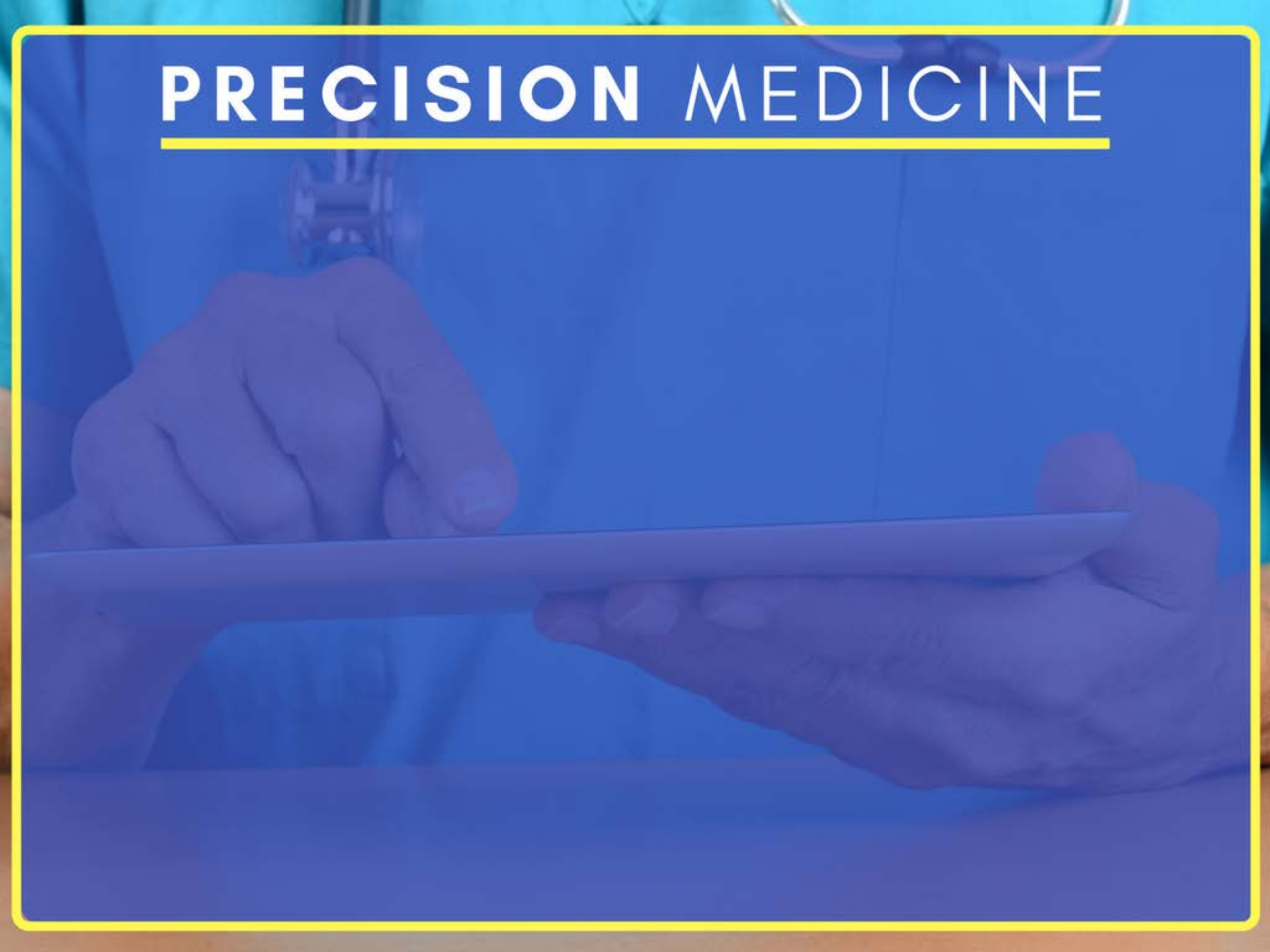
On average **1 person**
has a heart attack or will
develop a heart
complication within 30 days



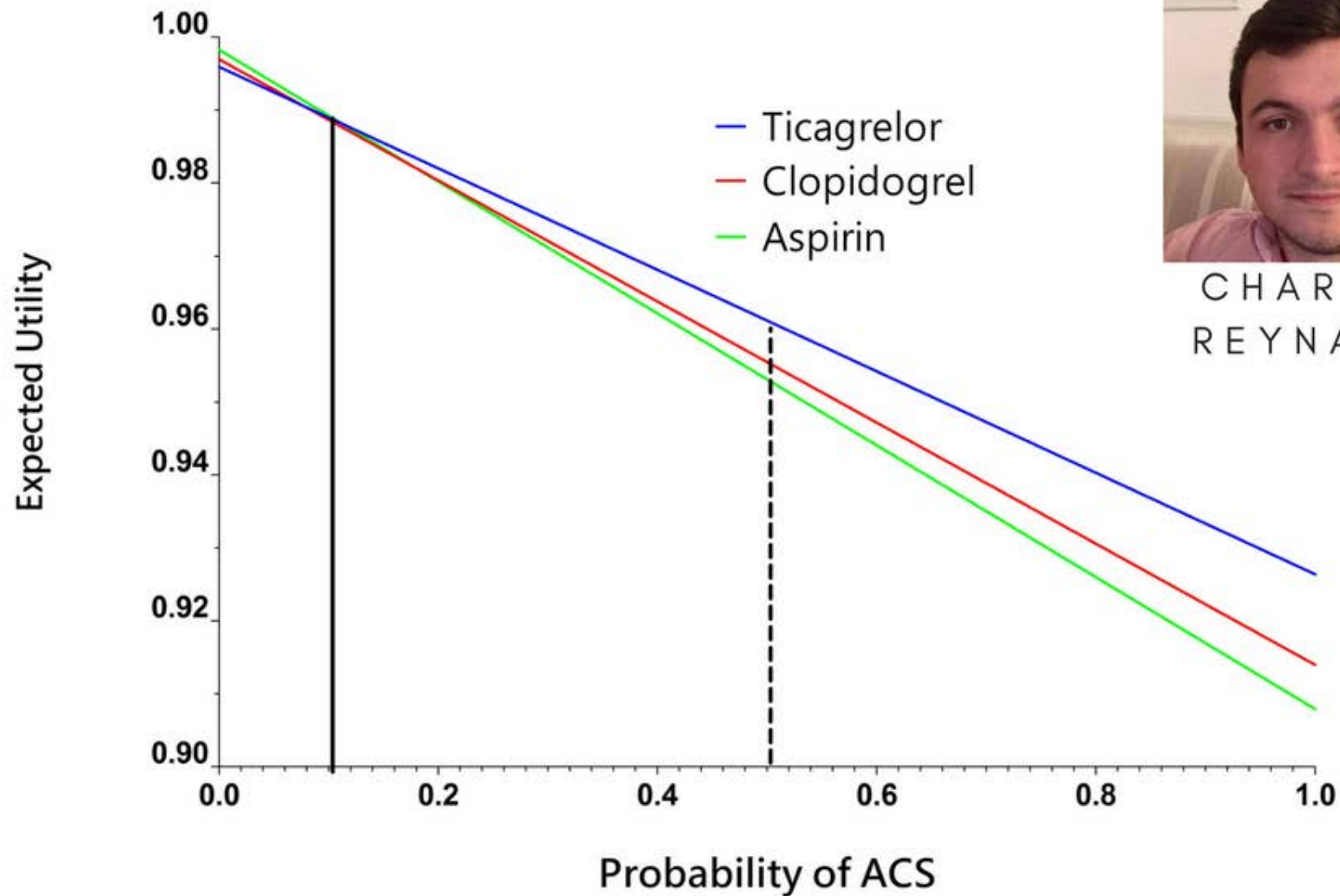
99 people do not.



PRECISION MEDICINE

The image shows a close-up of a person in a blue medical coat, likely a doctor, holding a white tablet with both hands. The person's face is partially visible at the top, wearing glasses. The background is a solid blue color. The text 'PRECISION MEDICINE' is written in white, bold, uppercase letters at the top of the image, underlined with a yellow line.

PRECISION MEDICINE

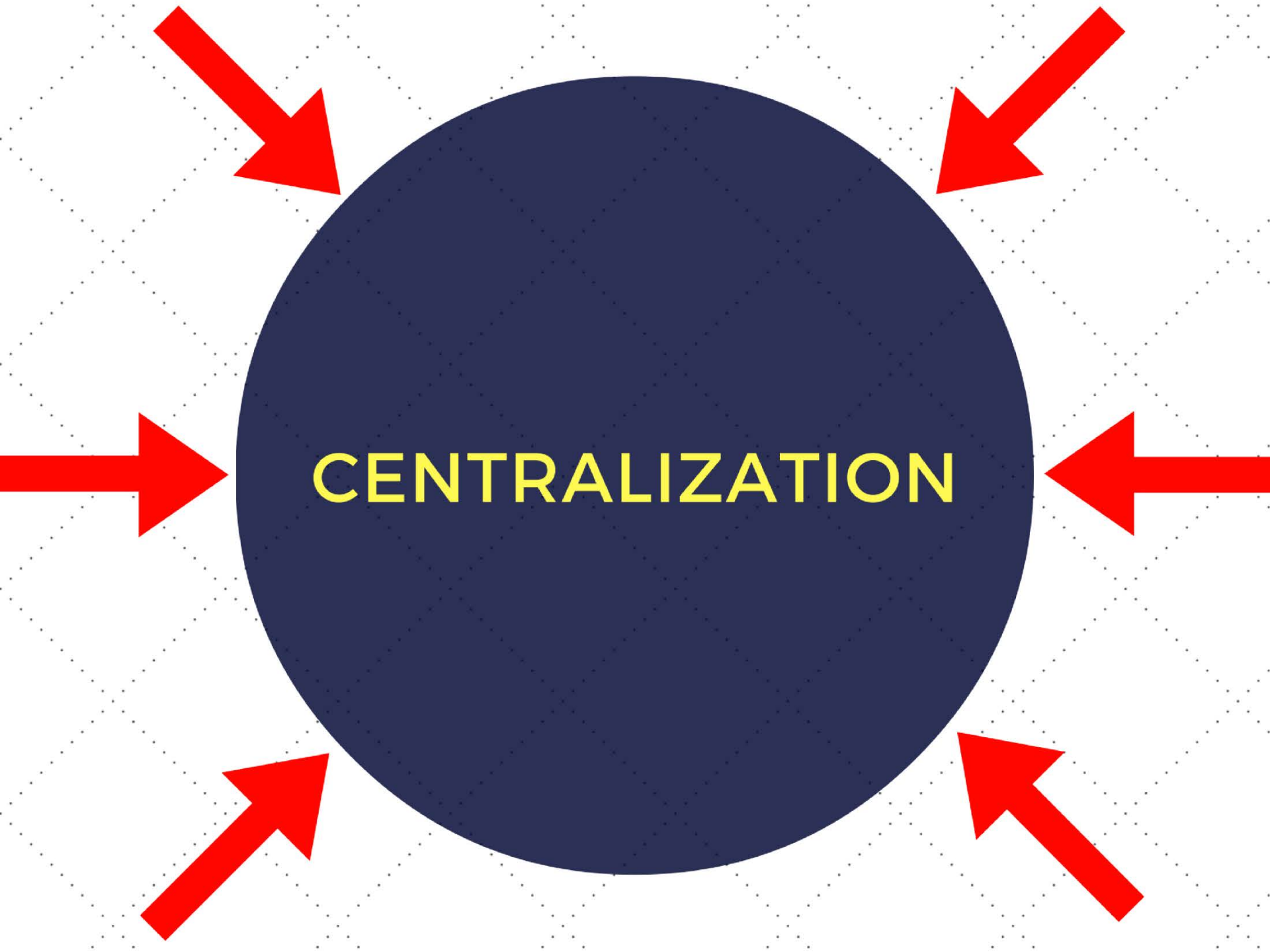


CHARLIE
REYNARD



POINT

OF CARE



CENTRALIZATION

Image: Benjamin Ellis via Flickr

CARE AT THE POINT OF NEED

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A woman with brown hair, wearing a light blue polo shirt, is shown in a hospital or clinical setting. She is holding her right hand to her stomach, indicating abdominal pain. The background is slightly blurred, showing medical equipment and a clean environment.

**ABDOMINAL
PAIN**

A man with dark skin, wearing a white polo shirt, is shown from the chest up. He is holding both hands to his head, with his fingers spread across his forehead and temples, indicating a severe headache. The background is a blurred clinical setting.

HEADACHE

**We can apply this method to
other conditions**



When you *change* the
way you look at things,
the things you look at

CHANGE

- WAYNE DYER