Cognitive bias

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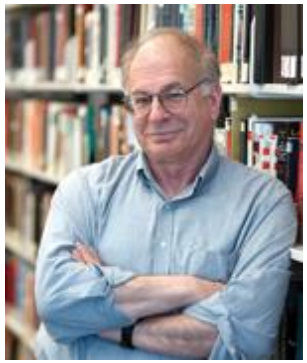
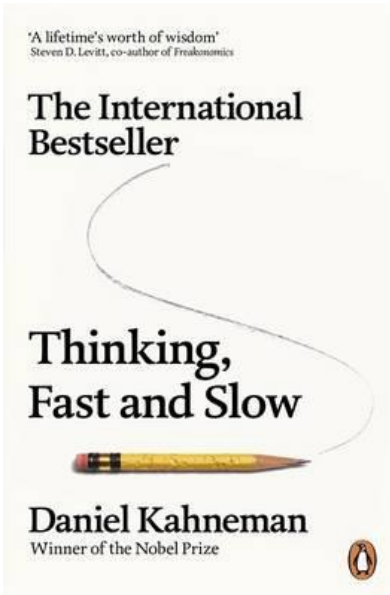
Cognitive determinants of decision-making

2 systems of thinking

- System 1: intuitive, fast, easy
  - Based on personal ‘mindlines’, heuristics, beliefs, judgments, preferences
  - Accurate for many decisions, but vulnerable to various cognitive biases (or systematic error driven by psychological factors)
- System 2: analytic, slow, takes effort
  - Based on science, rational

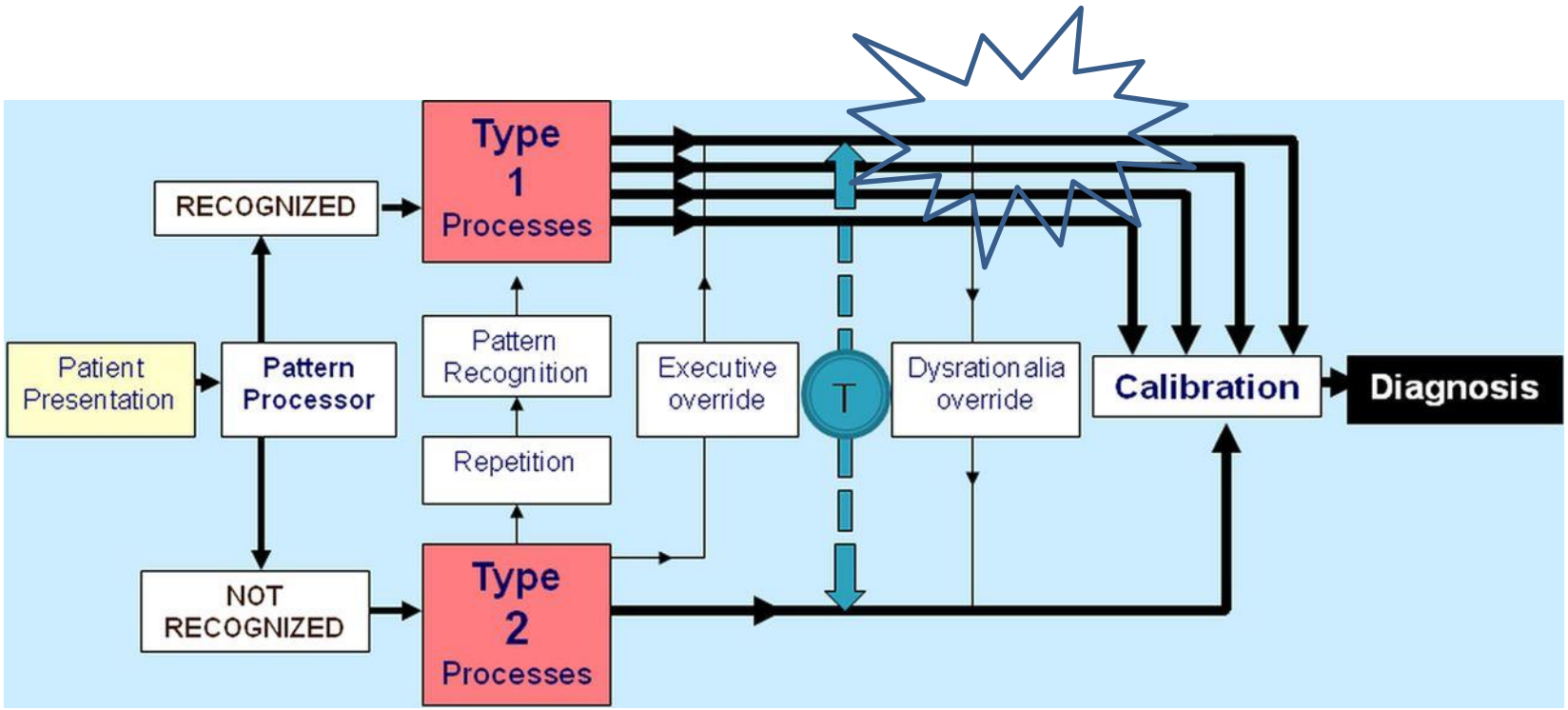
Data from a variety of environments demonstrates that human beings prefer to use System 1 processing whenever possible – physicians up to 95%





Lakoff G, Johnson M. Philosophy in the flesh: the embodied mind and its challenge to Western thought. New York: Basic Books, 1999

Dual process model for decision making.



Pat Croskerry et al. BMJ Qual Saf 2013;22:ii58-ii64

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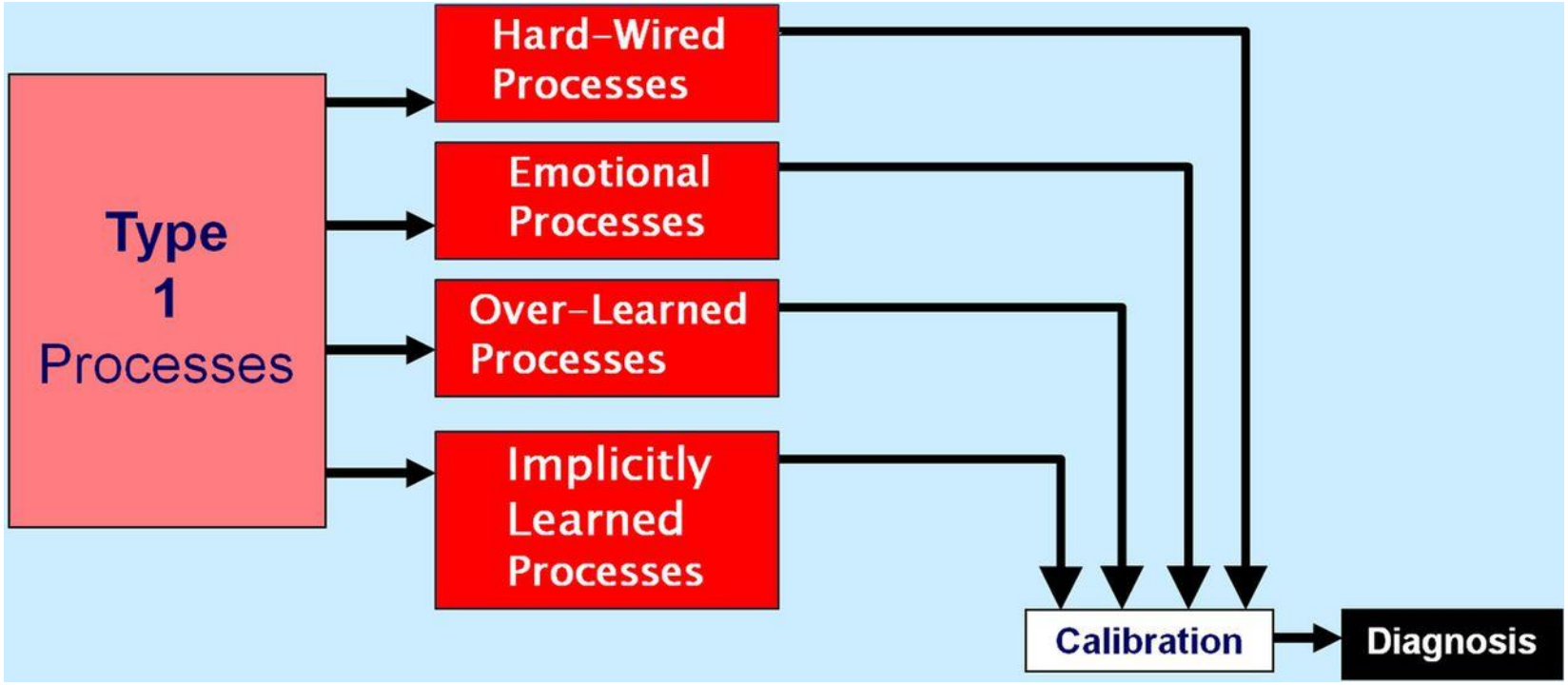
Origins of biases in Type I processes.



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Long waits to be seen

Fatigue

Phone calls

Noise

Uncertainty

Teaching obligations

Many sick patients

Full bladder

Work area design

Home stress

Dim lighting

New trainees

Faulty communication

Multi-tasking

Multi-tasking

Hunger

Violence

Ambiguity

Shift work

Short-staffed

Constant interruptions

Technology won't work

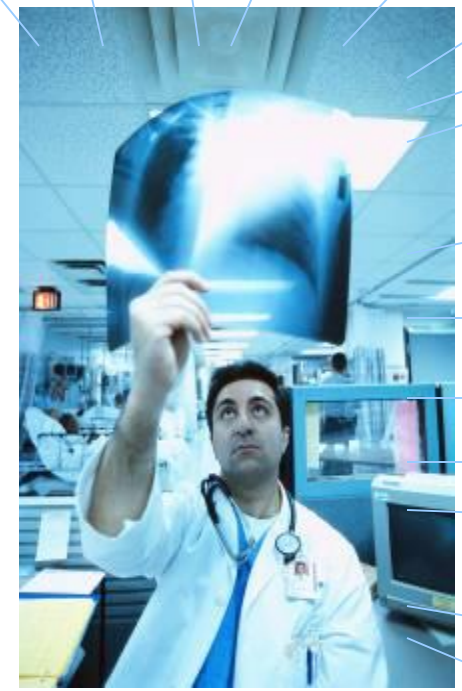
Need to hurry

Lack of resources

Availability of consultants

Angry patients

Faulty or missing processes



Cognitive Error

A failure in rational/logical thought

Often due to biases or ‘dispositions to respond’

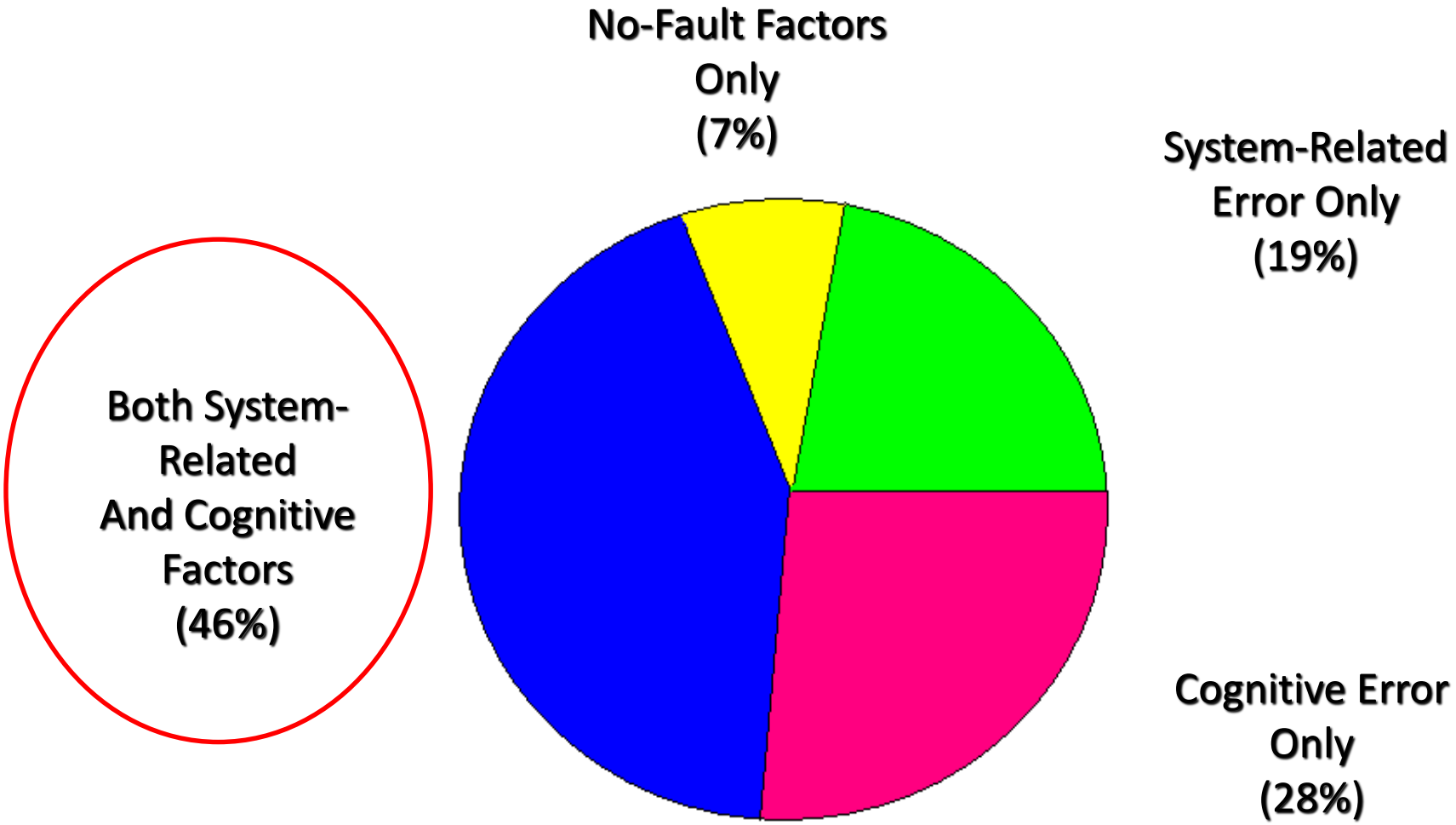
About 30+ known biases exist

They are universal

They are predictable

They can be corrected (cognitive de-biasing)

Causes of diagnostic error



Garber et al 2004. Diagnostic error in 100 patients

30 Cognitive Errors

Aggregate bias	Gender bias	Psych-Out Errors
Anchoring	Hindsight bias	Representativeness
Ascertainment bias	Multiple alternatives	Search satisficing
Availability	Omission bias	Sutton's Slip
Base rate neglect	Order effects	Triage-Cueing
Commission bias	Outcome bias	Unpacking principle
Confirmation bias	Overconfidence	Vertical line failure
Diagnostic creep	Playing the odds	Visceral bias
Attribution error	Posterior prob.	Ying-Yang Out
Gambler's Fallacy	Premature closure	Zebra retreat

Bias	Definition
Anchoring/ premature closure	Narrow focus on single feature in presentation to support a diagnostic hypothesis, despite other features refuting this hypothesis – accepting a diagnosis before it is fully verified
Availability bias	Tendency to think diagnoses that come immediately to mind are more likely or more common
Framing effects	Disproportionately influenced by how a problem is described, by whom, the setting, what has been previously accepted as a diagnosis (diagnostic momentum)
Base rate neglect/ Representativeness bias	Tendency to significantly overestimate likelihood of a diagnosis because the problem has some features representative of that diagnosis
Affective bias	Effects of emotional influences on thinking, including feelings towards their patients, both positive and negative
Overconfidence	Tendency to think one knows more than one does, especially if placing faith in opinions without gathering necessary supporting evidence
Blind obedience	Inappropriate deference to recommendations of authority (superiors, 'experts') in absence of sound rationale

Croskerry. Acad Med 2003; Odgie et al. Acad Med 2012; Graber et al. Arch Intern Med 2005

Anchoring

Prematurely settling on a single diagnosis based on a few important features of the initial presentation and failing to adjust as new information become available.

Diagnosis momentum:

Once a diagnostic label has been assigned to a patient by another individual, it is very difficult to remove that label and interpret their symptoms with fresh eyes.

Confirmation bias

Confirmation bias is the tendency to search for, interpret, favour, and recall information in a way that affirms one's prior beliefs or hypotheses.

Once you have formed an opinion, you have a tendency to only notice the evidence that supports you and ignore contrary evidence.

It is a type of systematic error of inductive reasoning.

Cognitive errors in medicine: The common errors. https://first10em.com/cognitive-errors/

Availability bias

Common things occur commonly

Experience based bias. The likelihood of a disease is supported when relevant examples come to mind

The diagnosis that hasn't been seen in a long time is less likely to be made.

Framing

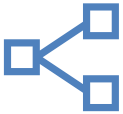
- Your decisions are influenced by the context in which the patient is seen and the source of the information.
- You are more likely to miss a AAA in a patient you are seeing in the ambulatory zone than if you were to see the exact same patient in a resuscitation room

Affective Bias

This is the tendency to convince yourself that what you want to be true is true, instead of less appealing alternatives.

Cases

Summary



25 year old male presenting with suicidal ideation

16:32; 17/4/2019
Hospital presentation

21:01 17/4/2019
Patient feeling increasingly anxious.
diazepam 5 mg;
olanzapine 10 mg

22:51; 17/4/2019

Code blue

05:30; 18/4/2019

ICU admission

16:13; 19/4/2019 Time of death

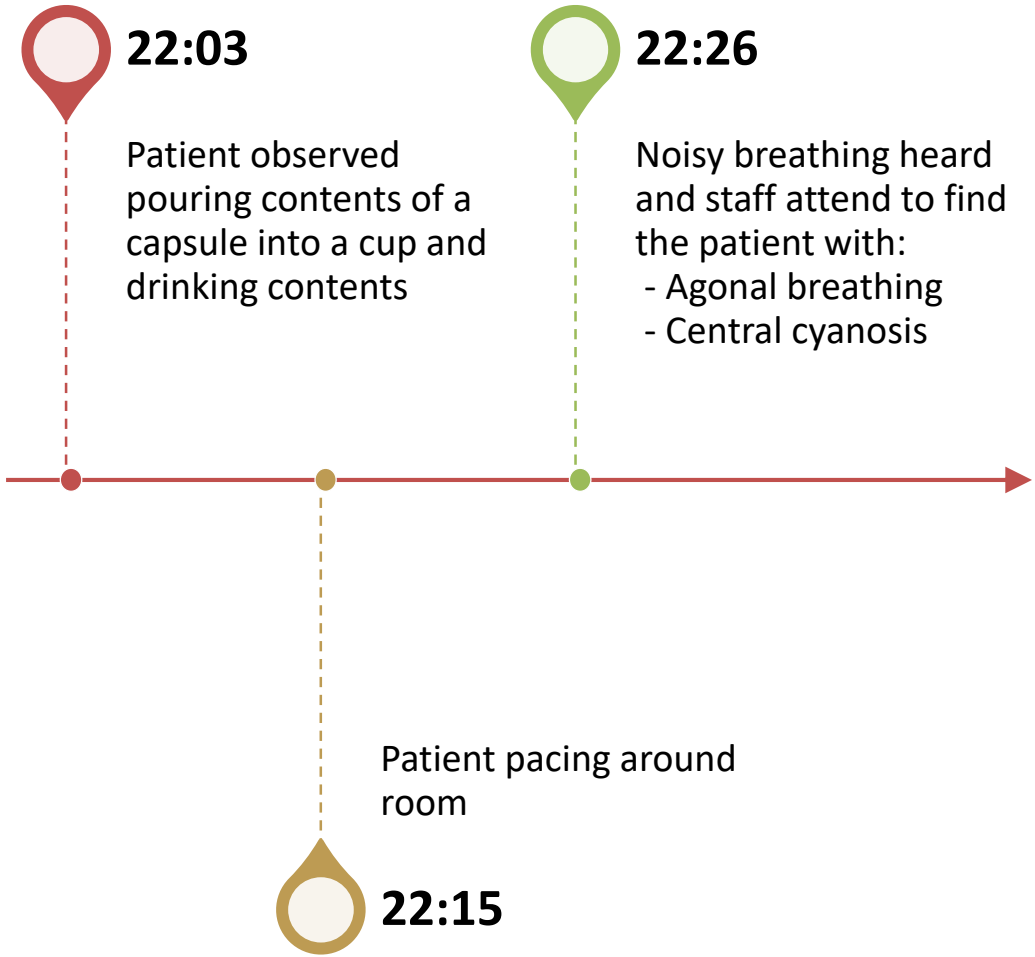
Referred to the coroner for review as *"violent or unnatural death"*

POCT VBG result

Blood gas values					
pH	7.424		[	-	]
pCO_2	42.6	mmHg	[	-	]
pO_2	68.9	mmHg	[	-	]
SBE_C	3.5	mmol/L			
Oximetry values					
ctHb	84	g/L	[	-	]
? sO_2	.....	%	[	-	]
FO_2Hb	2.5	%	[	-	]
FCOHb	2.6	%	[	-	]
FHHb	8.0	%	[	-	]
FMetHb	86.9	%	[	-	]
Electrolyte values					
cK^+	4.2	mmol/L	[	-	]
cNa^+	152	mmol/L	[	-	]
cCa^{2+}	1.00	mmol/L	[	-	]

A Venous Blood gas sample was collected during the emergency code at 22:37 on 17/04

From review of CCTV footage on 18/4/19



Further Investigations

Plasma sample taken 22:40 17/04

Undiluted

1:10

1:20

1:40

1:80

1:160

1:320

Plasma at 05:30, post methylene blue (undiluted)

Gastric Contents

Undiluted

1:100

1:1000

1:2000

1:10000

Sodium Nitrite Standards

1000 uM

500 uM

250 uM

100 uM

50 uM

25 uM

10 uM

25 uM

10 uM

0 mM


How could
this happen?

Bias

Anchoring

- The EP was looking at the issue as a cardiac arrest and did not look at all the information available

Confirmation

- Once the EP has formed an opinion, there is a tendency to only notice the evidence that supports that opinion and ignore contrary evidence

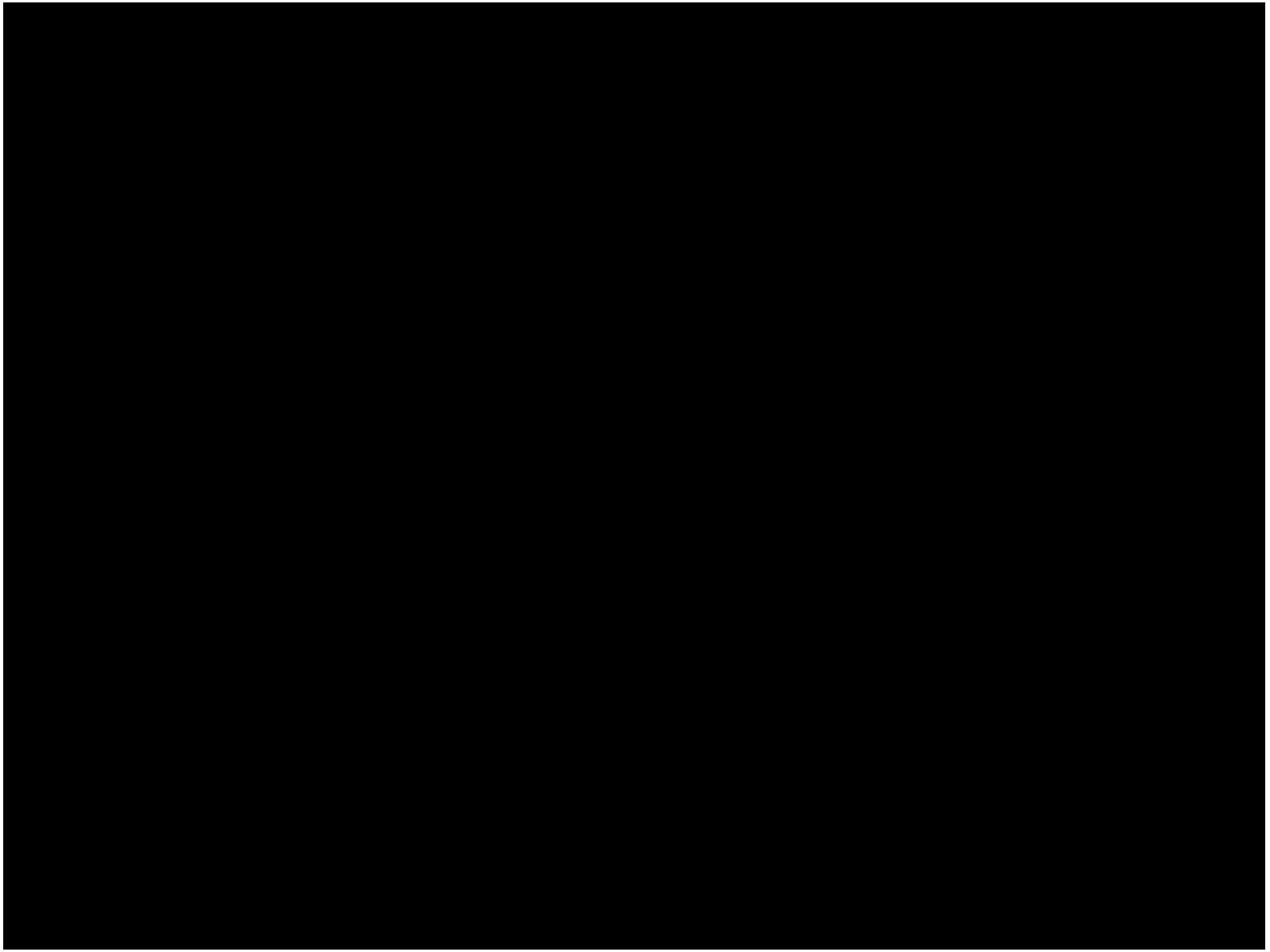
Framing

- The EP was influenced by the context in which the patient is seen – there was no prior indication of an overdose of this type

Availability

- Common things occur commonly and experience of the past influences present diagnosis and patterns of behaviour
  - The way VBG are reviewed
  - Past experience influences our diagnostic processes.
  - Most EPs will not see a fatal case of MetHb in their professional life

Framing



Case 2

A CT scan was performed to plan the surgical approach of a patient with non union of the mandible following a major operation for excision of head and neck cancer

This was not a routine cancer surveillance scan

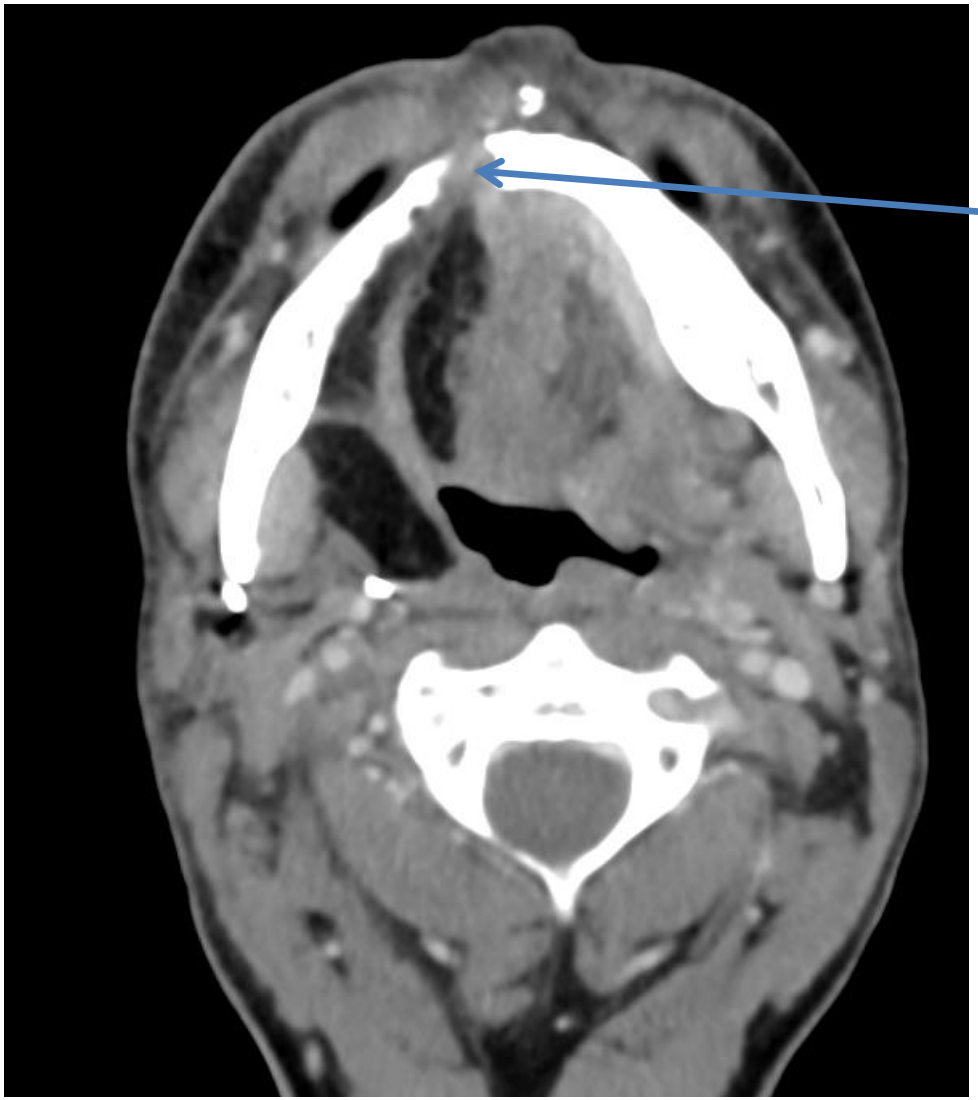
When his surgeon reviewed the neck CT scan the day after it was done, The surgeon's primary focus was on the mandible

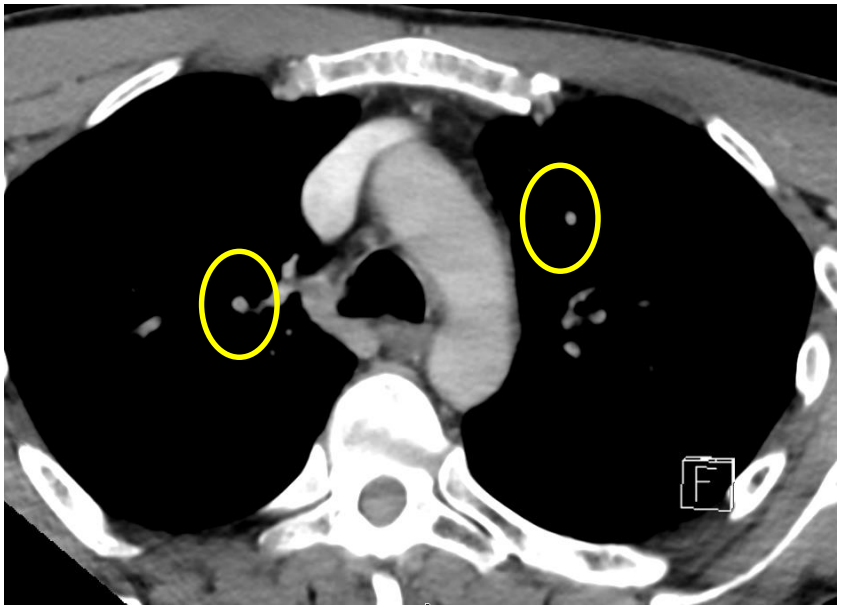
The surgeon failed to "see" the large apical lung metastasis visible within the scan

The formal radiology report was not available in the system until after this review appointment

The patient underwent hospitalisation and a mandibular plate, discharged uneventfully

6 months later he presented with seizures to another hospital with lung and brain metastasis





Bias

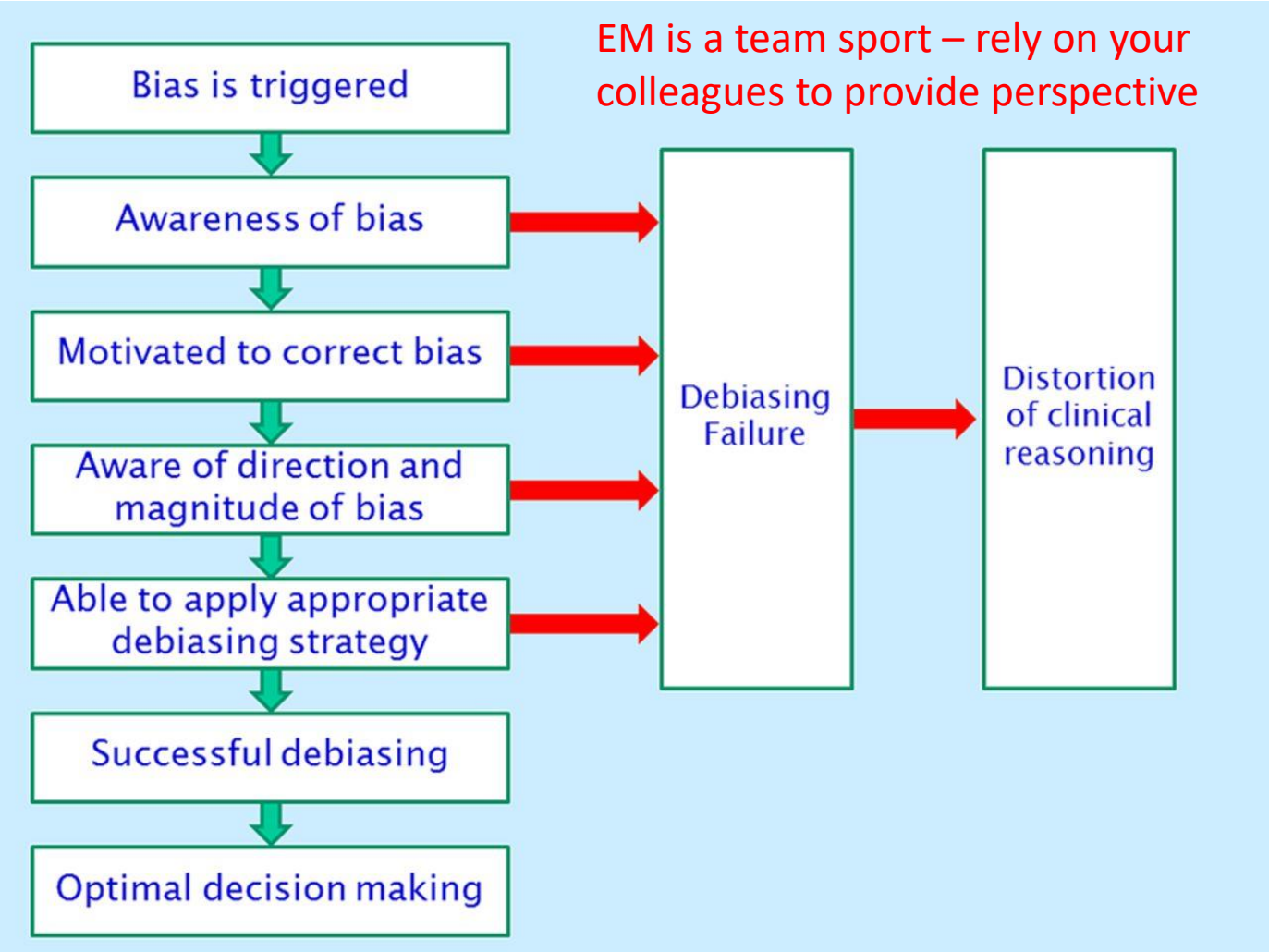
Anchoring

- The surgeon was looking at the issue he was needing to address surgically, rather than the whole scan

Framing

- The surgeon was influenced by the context in which the patient was being reviewed

Successive steps in cognitive debiasing (adapted from Wilson and Brekke).35 Green arrows=yes; Red arrows=no.



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Conclusion

- Need for a better understanding of cognitive biases and be content to challenge yourself
- Rely on your colleagues to dig you out of a “cognitive ditch”
- Debiasing strategies have strong face validity
- More research within the field of behavioural economics and human factors is needed
- Know yourself and challenge pattern recognition or system 1 approaches

Croskerry P, *et al. BMJ Qual Saf* 2013;**22**:ii58–ii64. doi:10.1136/bmjqs-2012-001712