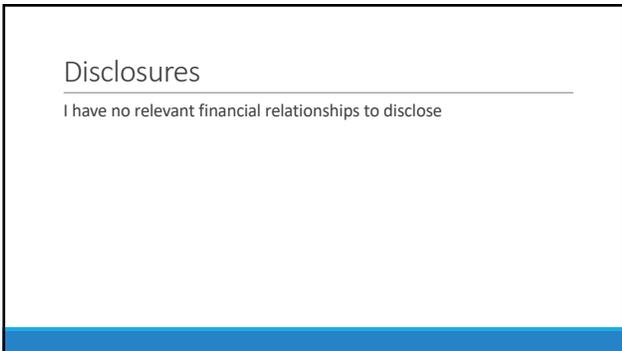
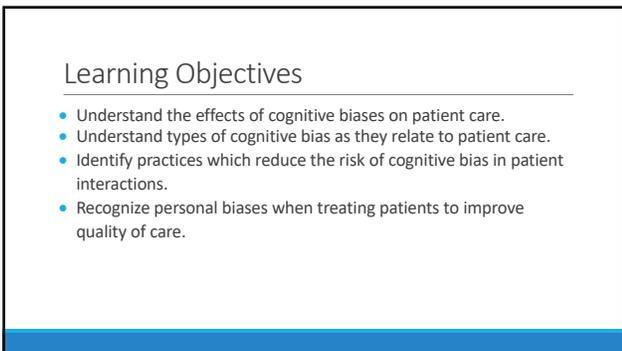




1



2



3

The Cost of Medical Error

- Up to 100,000 unnecessary deaths annually
- Up to one million injuries
- Estimated \$20 billion annually
- Average cost of a single event: \$4,685
- Average increased length of stay: 4.6 days¹⁹



Image source: freemagics.com

4

Sources of Medical Error

- System errors
 - Hand-offs between team members
 - Prescribing and dispensing of medications
 - Entry and delivery of laboratory orders and results
 - Documentation
- Diagnostic errors
 - Missed diagnoses
 - Delayed diagnoses
 - Wrong diagnoses

Reference: 6

5

Cognitive Error

- Large portion of diagnostic errors result from cognitive bias
- 75% of diagnostic errors are cognitive errors²⁵
- Diagnostic errors are most prevalent in:
 - Internal medicine
 - Family medicine
 - Emergency medicine²¹
- Cognitive errors have been identified in all steps of the diagnostic process

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Cognitive Error

- To err is human, even in medicine
- Lack of open discussion and analysis of cognitive errors
- “Cognitive Revolution” led to extensive research and literature on cognitive bias⁴
- Field of medicine lags behind
- Over 100 cognitive biases in the literature
 - At least 38 in medical literature

7

Cognitive Processing



TYPE 1

- Intuitive
- Fast
- Sub-conscious
- Pattern-recognitive
- Low cognitive burden
- Lacks executive censorship

TYPE 2

- Analytic
- Slower
- Methodical/systematic
- Critical evaluation data
- High cognitive burden
- Complex problem solving

Reference: 1, 3, 15, 22

Image source: freemagics.com

8

Cognitive Processing

- Dual Process Theory²²
- Type 1 “always on”, automatic, difficult to control
- Switch to type 2 thinking requires time and effort
- We spend about 95% of our time in type 1 thinking¹⁵
 - Efficient, time effective
 - More susceptible to cognitive bias

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Cognitive Bias and Heuristics

- Heuristics: cognitive shortcuts used to aid decision-making^{5,15}
 - Applied subconsciously
 - Intuitive, automatic
 - Easier and more efficient decision-making
- Daily decision-making (i.e. driving a car)
- Correct majority of the time
- More vulnerable to error/bias
- Cognitive bias when heuristics fail

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Cognitive Bias

- Ubiquitous
- Very difficult to override
- Do not correlate with intelligence
- Experience does not confer immunity¹⁶

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Types of Cognitive Bias

- Anchoring
- Availability
- Confirmation
- Diagnostic momentum
- Framing effect
- Hindsight
- Premature closure
- Search satisfaction
- Visceral bias

12

Anchoring Bias

- The tendency to lock onto a diagnosis early in the diagnostic process and failing to adjust this impression in the light of later information
- May anchor on the first positive finding and neglect to continue with a thorough history, examination, or investigation to rule out other findings
- May exclude relevant clinical facts or fail to adjust diagnoses
- “First impressions” or “jumping to conclusions”

Reference: 4, 10, 22

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Anchoring Bias

- The ability to look at a situation with fresh eyes becomes difficult once a diagnosis has been made
- May lead to premature closure of thinking
- Patient may be labeled with an incorrect diagnosis which, once attached, is difficult to remove

Reference: 1, 3, 8

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Availability Bias

- The disposition to judge things as being more likely, or more frequently occurring, if they readily come to mind
- Recent experience with a disease may inflate its likelihood of being diagnosed
- A disease not been seen for a long time (less available) may be underdiagnosed
- “Recency effect” vs. “out of sight, out of mind”

Reference: 4

15

Availability Bias

- Recent or particularly memorable events seem more likely to occur again because of how vividly they are recalled
- Novices more vulnerable
 - More likely to bring common prototypes to mind
 - Experienced clinicians are more able to raise the possibility of the atypical variant or zebra³

Reference: 3, 18

16

Confirmation Bias

- The tendency to look for confirming evidence to support a diagnosis rather than for disconfirming evidence to refute it, despite the latter often being more persuasive and definitive
- Assigning preference to findings that confirm a diagnosis or decision and choosing to explain away or simply ignore evidence that is contrary or unresponsive

Reference: 2, 4, 21

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Confirmation Bias

- Can lead to overlooking vital information and not asking all the right questions to diagnose and treat the patient accurately
- Stronger when information presented sequentially (i.e. ED)
- The longer one holds a decision or approach, the more difficult it becomes to break away from that thinking¹⁷

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Diagnostic Momentum

- The tendency for a particular diagnosis to become established without adequate evidence
- Once diagnostic labels are attached, they become “sticky”
- Starts as a possibility or opinion, gathers momentum until other possibilities are no longer considered
- A diagnosis may gather momentum without verification



image source: freemagics.com

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Diagnostic Momentum

- Suppresses further thinking
- Continuing a clinical course of action instigated by previous clinicians without considering the information available and changing the plan if required
- Be wary when a patient begins the exchange by volunteering his or her own diagnosis³

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Framing effect

- How clinicians see things may be strongly influenced by the way in which the problem is framed
- Reacting to a particular choice differently depending on how the information is presented
- Preferences vary when identical problems are presented in terms of potential gain rather than potential loss¹³
- Presenting evidence in a way that supports a diagnosis

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Hindsight bias

- Knowing the outcome influences the perception of past events
- Distort the perception of previous decision making
- Prevents a realistic appraisal of what actually occurred
- Decision errors seem transparent in hindsight
- “Knew it all along”, “wisdom after the fact”

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Hindsight Bias

- Does not take into account the prevailing conditions at the time the decision was made³
- Things look less complex than when the events unfolded
- Leads to an underestimation (illusion of failure) or overestimation (illusion of control) of the decision maker’s abilities⁴

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Premature closure

- The tendency to cease inquiry once a possible solution is found
- Leads to incomplete evaluation of a problem and perhaps incorrect conclusions
- Accepting a diagnosis before it has been fully verified
- Accounts for a high proportion of missed diagnoses
- “When the diagnosis is made, the thinking stops”

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Search Satisfaction

- The tendency to call off a search once something is found
- Ceasing to look for further information or alternative answers when the first plausible solution is found
- Commonly missed:
 - Comorbidities
 - Second foreign bodies
 - Other fractures
 - Co-ingestants in poisoning⁴

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Search Satisfaction

- A search satisfaction error is more likely to miss a subtle abnormality than an obvious one
- There is often more than one thing to be found, we are not always sure what it looks like, we do not always know where to look, and we often do not find anything

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Visceral bias

- Clinical decisions should be objective and consistent
- We develop both positive and negative feelings toward patients which impact decision quality
- Positive countertransference³
 - Underinvestigation (outcome bias, value bias)
 - Overinvestigation (fear of missing something)
- Negative countertransference

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Causes of Cognitive Bias

- Patient-provider relationship
- Resource depletion theory²²
- Time constraints
- Overconfidence
- Absence of timely feedback
- Lack of differential diagnoses
- Burnout / fatigue / cognitive overload
- Dual task phenomenon¹²
- Blind-spot bias

Reference: 1, 8, 12, 16, 19, 20, 21, 22

28

Debiasing Strategies

- Education
 - Cognitive biases
 - Evidence-based medicine
- Simulation
- Differential diagnosis
 - Software
 - Consider alternatives
 - Balanced testing



Reference: 4, 7, 12, 22 Image source: freemagics.com

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Debiasing Strategies

- Second opinions
- Decrease reliance on memory⁴
 - Mnemonics
 - Clinical practice guidelines
 - Algorithms
- Cognitive forcing strategies¹⁵
 - Demands ordered thinking
 - Forces cognition onto certain topics
 - Checklists



Image source: freemagics.com

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Debiasing Strategies

- Minimize time pressures
- Slow down
 - Taking your own history
 - Diagnostic time out
- Reflection¹⁴



image source: freemagics.com

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Where do we start?

- Knowledge is power
- Be skeptical and insightful
- Be humble
- Work together
- Doing something is better than nothing
- Overcoming challenges

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Thank you!

Questions?

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