Behavioral Economics

1. BE Module

1.1 Behavioral Economics:

1.2 Medical Training Education

* 1-3 year fellowship
* 3-7 years residency
* 1 year internship
* 4 years medical school
* 4 years undergrad
* Knowledge base
1.3 Procedural Knowledge?

Procedural Knowledge?

1.4 Untitled Slide

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1.5 Medical Errors

Medical Errors

- 44,000-98,000 Americans
  - Individual factors
  - Systems factors

But...
“Anesthesia is an area in which very impressive improvements in safety have been made.”

1/200,000–1/300,000 mortality

1.6 Untitled Slide

**Eichhorn, Anesthesiology 70:572-7, 1989**

- Massachusetts 1976 – 1988
- “1,001,000 Anesthetics in ASA Status 1 or 2 patients resulted in 11 cases of major intraoperative accidents reported to malpractice insurance carrier, including 5 intraoperative deaths”
- 1: 200,200 anesthetic deaths
1.7 Anesthesia Morality: Data-Mining

Anesthesia Morality: Data-Mining

- Suburban hospital network (1992-94)
  - 115 deaths in 37,924 anesthetics (1:330)
  - Human error: 3:115 deaths (2.6%)
  - Anesthesia-related deaths: 1:12,641
- Urban hospital network (1995-99)
  - 232 deaths in 146,548 anesthetics (1:632)
  - Human error: 11,232 deaths (4.7%)
  - Anesthesia-related deaths: 1:13,322

(Capoce. Anesthesia 97: 1609-17. 2002)

1.8 Errors in Judgment?

Errors in Judgment?

- # Judgments / day?
- How many errors are:
  - Insignificant to patient care
  - Go undetected
  - Go unacknowledged/denied
- Exponentially higher

“I have done nothing wrong. It was an error of judgement.”
1.9 Error-Prone?

- 5 observation sites:
  - Geographic, academic, practice diversity
  - Baystate, NYU, Lehigh Valley, MUSC, St. John’s StL
- 20 cases:
  - 2 sets of trained observers/site/case
- **847 errors observed**
  (at sites that are focused on safety!)

1.10 Untitled Slide

**flightsafety**

**Heroic compensations:**

The benign face of the human factor

- 100,000,000 errors will be made in the cockpit each year
- There will be 25 aviation accidents
- **Strategy: Error Management**

“...The data show that 72 per cent of flights observed encountered one or more threats, with an average of two per flight...”
1.11 Untitled Slide

Errors 1:
Interruptions, fatigue, time pressure, anger, distraction, anxiety, fear, or boredom
Errors 2:
Lack of knowledge

December 1984

1.12 Untitled Slide

Fig 1 Most common causes of death in the United States, 2013.

Cancer 25%
Heart disease 43%
Motor vehicles 6%
Suicide 4%
Firearms 3%
COPD 11%

Based on our estimates, medical error is the 3rd largest non-cancer cause of death in the US.

All causes 2.597%

Martin A Makary, and Michael Daniel BMJ 2017;359:j2153
1.13 Untitled Slide

"The majority of diagnostic failures, probably over 75% can be attributed to physician thinking failure."

1.14 Untitled Slide

"Olympians versus lesser mortals"

"...Use quantitative formulas and techniques dispassionately, objectively, rationally, carefully weighing all the best evidence, in an environment where there is no lack of resources, no throughput pressures, no interruptions or distraction, optimal workplace ergonomics, good information technology, and when they are rested and well slept."

1.15 Untitled Slide

1.16 Decision-Making:

Decision-Making: Dual Process Theory

- **Fast**
  - Automatic
  - Initiative
  - Intuitive
  - Visceral
  - Rapid
  - “WYSIUT”

- **Slow**
  - System 1:
    - Considered
    - Effortful
    - Focused
  - System 2:
    - Secondary
    - Slower
    - Gray
1.17 “Intuitive Decision-Making”

“Intuitive Decision-Making”

1.18 Tools used in System 1

Tools used in System 1

- Heuristics
- Satisficing
- Emotional responsibility
- Experiential-Inductive
- Gestalt effect/
  Recognition-primed

Croskerry P. A Universal Model of Diagnostic Reasoning. Acad Medicine, Vol. 84, 6/2019
1.19 System 1:

System 1: Recognition Primed Decision-making

- "Naturalistic Decision-Making"
- Fire-fighters, aviators, nuclear power, military
  - Time pressure
  - High-stakes
  - Inadequate information
  - Unclear goals
  - Poorly defined procedures

1.20 Upside to System 1:

Upside to System 1: Intuitive thinking

- Fast
- Inexpensive (Efficient)
- Attention unnecessary
- Parallel processing
- Darwinian
  - "No paralysis by analysis"
1.21 Downside to System 1:

Downside to System 1: Intuitive Thinking

- Systematic and predictable errors
  - Irrational
  - Emotional responsivity
  - Situational responsivity
  - Biases

1.22 Decision-Making:

Decision-Making: Dual Process Theory

System 1:
- Automatic
- Intuitive
- Impulsive
- Irrational
- “Blink”
- “What if?”

System 2:
- Considered
- Effortful
- Focused
- Secondary
- “Slow”
- “Why”
1.23 System 2:

System 2: Analytical Thinking

- Hypothetic-deductive
- Unbounded rationality
- Robust decision-making
- Acquired, critical, logical
- Deliberate, purposeful thinking

1.24 System 2: Analytical thinking

System 2: Analytical thinking

- Upside
  - Precise
  - Accurate

- Downside
  - Slow
  - Expensive
    - Energy
    - Attention
    - Time
1.25 Dual Process Theory

Dual Process Theory

1.26 Untitled Slide

Two Families of Mental Operation

- System 1
  - Automatic, effortless, quick
  - Largely unconscious, difficult/impossible to control
  - Operates on biases and heuristics
  - Does most of the work of thinking

- System 2
  - Controlled, effortful, slow
  - Usually conscious
  - Logically coherent, rule-governed
  - Lazy, difficult to engage
  - Who we think we are
1.27 fMRI Data

**Areas of the Brain Affiliated with System 1 Processing**

- Superior medial frontal
- Anterior cingulate
- Posterior cingulate
- Precuneus

**System 1 Characteristics**
- Holistic
- Emotionally sensitive
- Sensitivity to subtle differences
- Predominantly reactive
- From past experiences
- Units react to concrete images, metaphors, and narratives
- More rapid processing oriented toward immediate action
- Self-awareness yields "experiencing is believing"

**Areas of the Brain Affiliated with System 2 Processing**

- Bilateral medial frontal
- Precuneus
- Bilateral angular gyrus

**System 2 Characteristics**
- Analytical
- Logical analysis oriented
- Unaffected by conscious appraisal of events
- Coarser, less vivid, abstract, symbolic
- Requires justification via logic and evidence

1.28 Untitled Slide

**Attitudes and Social Cognition**

Evidence-Based and Intuition-Based Self-Knowledge: An fMRI Study

Matthew D. Liberman, Shante W. Pope, and Tyre W. Sage

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1.29 Untitled Slide

![Neural processes underlying intuitive coherence judgments as revealed by fMRI on a semantic judgment task.](image)

1.30 Untitled Slide

![Pattern Recognition](image)
1.33 Untitled Slide

1.34 Untitled Slide
1.37 Most Common Medical Biases

Most Common Medical Biases

1. Representative Bias
2. Availability Bias
3. Framing Bias
4. Confirmation Bias
5. Anchoring Bias
6. Affective Bias

1.38 Representativeness Bias

Representativeness Bias

- Tendency to overgeneralize from a few characteristics or observations
1.39 Representativeness Bias

Representativeness Bias

Risk of:
- Base Rate Error
- Premature Closure
- Gambler’s Fallacy
- Overconfidence

1.40 Availability Bias

Availability Bias

- Assess likelihood by considering examples that come easily to mind
  - Media coverage
  - Anecdotes
  - Academic activity
  - Memorable events
1.41 Framing Bias

Framing Bias

- Selecting or highlighting certain aspects which redirects attention and focus
- No change to facts

1.42 Confirmation Bias

Confirmation Bias

- Seeking information that will only support our beliefs
- Ignores and under-weighs evidence that refutes our beliefs
1.43 Anchoring Bias

Anchoring Bias

- Overly-fixated on initial information and ignoring subsequent information
- Impacted by cognitive load:
  - Fatigue
  - Stress
  - Complexity
  - Emotional states

1.44 Affective Bias

Affective Bias

The affective state of the decision-maker adversely affects decision-making
1.45 Affective Bias

Affective Bias

The affective state of the decision-maker adversely affects decision-making

1.46 Biases in Review

Biases in Review

1. Representative Bias
2. Availability Bias
3. Framing Bias
4. Confirmation Bias
5. Anchoring Bias
6. Affective Bias
1.47 Step One: Appreciate Decision-Making

1.48 Step One: Appreciate Decision-Making
1.49 Untitled Slide

1.50 Step 2: Appreciate Context

Step 2: Appreciate Context

Figure 1: The effect of context on meaning

Figure 2: Effect of context on perception of line height

Crank, P. (2009). Context is everything or how could I have been that stupid? Healthcare Quarterly (Toronto, Ont.), 12
s27–6.
1.51 Untitled Slide

Context Is Everything or How Could I Have Been That Stupid?

Pat Crumley

1.52 Untitled Slide

BJA

REVIEW ARTICLE
The role of non-technical skills in anaesthesia: a review of current literature

G. C. L. Pincoletti, P. McGeorge, R. R. Flier, R. J. Garcia, and N. J. Mosta

The ANTS System

TEAM WORKING
Coordinating activities
with team
Exchanging information
& understanding
Communicating &
Coordinating
Supporting others

SITUATION AWARENESS
Surfacing information
Recognising &
Anticipating

TAX MANAGEMENT
Planning & preparing
Prioritising
Providing &
Analytic standards
Identifying & utilising resources

DEcision making
Identifying options
Balancing risks &
Selecting options
Time managing

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1.53 **Before Decision-Making:**

Before Decision-Making:
Situational Awareness

1.54 **Step 3: Situational Awareness**

**Step 3: Situational Awareness**

- Gathering information
- Interpreting information
- Anticipating future states

“Mental Model”

1.55 Deeper Dive:

Deeper Dive: Situation Awareness

1.56 Are you Aware?
1.57 Situational Awareness = Capacity

1.58 Minimize loss of SA

1. Good Briefing
2. Fitness for work
3. Distractions/interruptions
4. “Sterile Cockpit”
5. Updating
6. Self-Monitoring
7. Speaking up
8. Time Management
1.59 Untitled Slide

1. Appreciate the Decision-Making Process
2. Always consider Context
3. Maintain a Situational Awareness
4. Call for Help