Cognitive Errors in Outbreak Decision Making

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#Hello my name is Evonne

Doctor of Nursing

Led IPS RnD ‘10-’13

Publications

Worked at HPS as nurse consultant 2006-15

First to use SPCs for MRSA & CDI

Campaign medals:
Legionella, Salmonella, CDI, MRSA, MSSA VISA, RSV, Influenza, Parainfluenza, Infusate-related BSI outbreaks, Gp A Strep, Pseudomonas, Pseudo-outbreaks, CPE, Endoscopy-related outbreaks, BBV, Norovirus, CA-UTI outbreak, etc.

ICN 1987
Hospital outbreaks

Outbreak column 2: norovirus, our perennial infection control winter challenge

Outbreak column 3: outbreaks of *Pseudomonas* spp from hospital water

Outbreak column 4: an ‘infection control never event’ – nosocomial bloodborne virus outbreak

Outbreak column 5: *Streptococcus pyogenes* (Group A Streptococci) (GAS)

Outbreak column 6: Outbreaks in neonatal intensive care units (NICUs)

Outbreak column 7: Pseudo-outbreaks (part 1)

Pseudo outbreaks and no-infection outbreaks (part 2)

Outbreak column 8: Endoscopy-related outbreaks

Outbreak column 10: What causes outbreaks – questions of attribution

Outbreak column 11: Consequences of outbreaks; lessons for healthcare workers and infection prevention and control

Outbreak column 12: Nosocomial *Staphylococcus aureus* outbreaks (part 1)

Outbreak column 13: Nosocomial *Staphylococcus aureus* outbreaks (part 2 – guidelines)

Outbreak column 14: *Staphylococcus aureus* - new outbreaks of old infections

Outbreak column 15: Carbapenemase-producing *Enterobacteriaceae*

Outbreak column 16: Cognitive errors in outbreak decision making

Outbreak column 17: Situational Awareness for healthcare outbreaks

Outbreak column 18: The undervalued work of outbreak: prevention, preparedness, detection and management

Outbreak column 19: needleless connectors (NCs) tales from nine outbreaks

Outbreak column 20: are outbreaks man-made disasters that display intertwined errors of human judgement and behaviour?
However….

- No experience of fur, artiodactyla or four legs
In this presentation

• Change of focus – our (likely) errors not theirs
• Why?
  – We are vulnerable to making poor decisions during uncertainty (and having them endorsed)
  – When we don’t, or just delay, in getting it right people (and animals) suffer
  – To aid Outbreak: Prevention, Preparedness, Detection and Management
  – We make mistakes.....
The “point” of bias research is that where people have no good reason to act sub-optimally, [the study of] errors suggest that they just do not know any better.’

Prevention
SICPs;
What we do every day;
Removing recognised risks

Preparedness
Its likely to happen;
Get ready – Practice;
Become able to detect;
This is what it looks like / to do...

Management
Stop transmission;
Investigate how / why & prevent recurrence

Detection
From clinical, lab, surveillance data, find outbreaks if present

Outbreak
This disaster… and many other man-made disasters was the result of 5 intertwined errors of judgement and behaviour (Rumelt 2011)

• Engineering overreach
  – ways in which system can fail and consequences are > than systems ability to cope
• Smooth sailing fallacies
  – We are not having that problem
• Insider view
  – Ah… but we are different – its just a blip
• Risk-seeking incentives
  – Other priorities – hours in a bed in A&E
• Social-herding
  – No different to others
Cognitive errors are thought-processing errors, or thinking mistakes, which can lead to incorrect [outbreak PPDM] decision-making

(adapted from Stiegler et al., 2012).
Cognitive errors – bias in our assessment of reality (loss of situation awareness)

Optimal situational awareness
Potential for optimal decision making
Its not just the science of outbreaks

What it takes to be mindful

Where & why we and they lose it

Why it goes wrong: bluffs, biases and behaviours that make us err

How it goes wrong

Traditional novice to expert pathway
Its not just the science of outbreaks

What it takes to be mindful

Where & why we and they loose it

Why it goes wrong: bluffs, biases and behaviours that make us err

How it goes wrong

Traditional novice to expert pathway

High-Reliability Theory

Situational Awareness

Biases & Effects – Human Factors

Human Error Theory

Experience - on the job training, Personal reading, Specialist training / qualification

There are experts in just making systems less error prone.
Outbreak challenge

• Keep PHVs PEOPLE AND ANIMALS safe in a potentially unsafe environment
• Whilst allowing other healthcare systems to operate optimally
• Whilst: assessing, communicating, delegating, teaching, advising, documenting, reassuring, explaining, collecting data, collecting specimens, analysing, presenting data, administrating, coordinating, learning, epidemiologising, trying to find x,y,z, trying to get hold of a,b,c, minute taking, minute checking, administrating)
• Under extreme time pressures
• Under extreme service pressures
• Under media spotlight
• Under ministerial pressure
• Under the control of various legislation
  – HSWA, COSHH, RIDDOR, DATA PROTECTION, Code of Practice
So just how do we err during outbreaks?
Reason's Swiss Cheese Model

Its never the last thing....

- Organisation & Culture
  - ETHOS
- Current conditions of work
- Unsafe acts
- Active failures
- Outbreak-provoking conditions
  - (Latent errors)
- Defences
- Outbreak
Unsafe act

Unintended

Slips

Skill based

Attention failure

Lapses

Attention failure

Intended

Mistakes

Rule Based

Wrong rules
Right rule badly

Violations

Intention to commit

Knowledge based

No rules T&E

Intention to cause harm

From Human Error by Reason 1990, 207p
Workload during an outbreak

Time available per task
Goals for tools:

- Eliminate omission error
- Simple
- Standardised
- Don’t diminish insights
- Increase time available
Outbreaks increase our risk of errors

More to do
More to forget
Commonest error – we forget
Tool 1: Checklist & Algorithm

- Equivalent pilot response
- Not to undermine experts – but support them
- Do / confirm done (not read / do)

The Checklist Manifesto: How to get things right, Atul Gwande
Seeing what others don’t: the remarkable ways we gain insights
Gary Kelin, Nicholas Brealey Publishing
KEY PRINCIPLES

28. The key principles of Incident Management are:

- A state of preparedness;
- Clarity of purpose and integrated working;
- An early and effective response;
- Effective communication with the public and among agencies;
- Learning from experience; and
- Workforce education development
What are the goals?

- Promote & enable the prevention of cross-transmission & infection
- Detect an outbreak if one is present
Critical
(not necessarily experienced before)
command leadership

• Situation Awareness
  – Perception - What is happening?
  – Comprehension - So what?
  – Prediction - What next if nothing changes?

Dr Mica Endsley – engineer with USAF

From Human Error by Reason 1990, 207p

Unsafe act

Intended

Mistakes

Violations

Skill based
Attention failure

Slips

Lapses

Rule Based
Wrong rules
Right rule badly

Knowledge based
No rules T&E

Intention to commit

Intention to cause harm
Situation Awareness

Level 1 – Perception – what is happening?
If lost – fail to see (all) the dots

Level 2 – Comprehension – So what?
If lost – fail to see the consequences

Level 3 – Prediction – what next?
If lost – unless we do x, y will happen
21st Nov 2013 – an asymptomatic XDR-Ab carrier was identified on the oncology unit in a 637 bed primary and tertiary hospital. All 32 patients in the unit were screened.

Results: 7 additional XDR-Ab carriers have been identified (25% prevalence).
Initial epi curve
First identified case + 7 on screening

Gray et al 2016 93 29-34 Journal of Hospital Infection
After lookback – 17 earlier cases

Outbreak declared 21/11/2013
The actual situation pre-November

Perception: Level 1 failure - did not see the early cases
Comprehension: Level 2 failure – did not see outbreaks
Prediction: Level 3 correct - Action needed hospital wide

Gray et al 2016 93 29-34 Journal of Hospital Infection
**Prevention**
SICPs; What we do every day; Removing recognised risks

**Preparedness**
Its likely to happen; Get ready – Practice; Become able to detect; This is what it looks like / to do...

**Management**
Stop transmission; Investigate how / why & prevent recurrence

**Detection**
From clinical, lab, surveillance data, find outbreaks if present

**Outbreak**
Prevention
SICPs;
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Outbreak

Management
Stop transmission;
Investigate how / why & prevent recurrence

Detection
From clinical, lab, surveillance data, find outbreaks if present
The human brain seeks patterns and rules.  
..If it finds no familiar patterns, it simply invents some....

Dobelli  The art of thinking clearly
<table>
<thead>
<tr>
<th>Action bias</th>
<th>Endowment effect</th>
<th>Introspection illusion</th>
<th>Procrastination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affect heuristic</td>
<td>Envy</td>
<td>It will get worse before it gets better</td>
<td>Pseudocertainty effect</td>
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<tr>
<td>Ambiguity aversion</td>
<td>Expectations</td>
<td>Liking bias</td>
<td>Reciprocity</td>
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<tr>
<td>Authority bias</td>
<td>Experimenter's expectation bias</td>
<td>Loss aversion</td>
<td>Rhyme as reason bias</td>
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<tr>
<td>Availability cascade</td>
<td>Failure to close doors</td>
<td>More credential effect</td>
<td>Scarcity error</td>
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<td>Backfire effect</td>
<td>Fear of neglect</td>
<td>Motivation crowding</td>
<td>Semmelweis reflex</td>
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<td>'Because ' effect</td>
<td>Forecast illusion</td>
<td>Negativity effect</td>
<td>Selective perception</td>
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<tr>
<td>Belief bias</td>
<td>Fundamental attribution error</td>
<td>Neomania</td>
<td>Sleeper effect</td>
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<td>Bias blind spot</td>
<td>Gambler's fallacy</td>
<td>News illusion</td>
<td>Social Comparison bias</td>
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<td>Chauffer knowledge</td>
<td>Group think</td>
<td>Not invented here syndrome</td>
<td>Social desirability bias</td>
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<tr>
<td>Choice-supportive</td>
<td>Halo effect</td>
<td>Normalcy bias</td>
<td>Social loafing</td>
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<td>Cognitive Dissonance</td>
<td>Hedonic treadmill</td>
<td>Omission bias</td>
<td>Social proof</td>
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<td>Confirmation bias</td>
<td>Hindsight bias</td>
<td>Optimism bias</td>
<td>Story bias</td>
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<td>Contagion bias</td>
<td>House money effect</td>
<td>Ostrich effect</td>
<td>Strategic misrepresentation</td>
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<td>Contrast effect</td>
<td>Illusion of attention</td>
<td>Over-confidence bias</td>
<td>Subjective validation</td>
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<td>Curse of knowledge</td>
<td>Illusion of control</td>
<td>Over-thinking</td>
<td>Sunk cost fallacy</td>
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<td>Decision fatigue</td>
<td>Illusion of skill</td>
<td>Pareidolia</td>
<td>Twaddle tendency</td>
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<td>Deformation Professionelle</td>
<td>Impact bias</td>
<td>Personification</td>
<td>Volunteer's folly</td>
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<td>Default effect</td>
<td>In group–out of group</td>
<td>Planning fallacy</td>
<td>Winner's curse</td>
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<td>Domain dependence</td>
<td>Incentive super-response tendency</td>
<td>Post-purchase rationalisation</td>
<td>Zeigarnik effect</td>
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<td>Effort justification</td>
<td>Information bias</td>
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Bias in thinking

• 3 main classes of bias:
  – Availability
  – Representativeness
  – Anchoring & Adjustment

<table>
<thead>
<tr>
<th>Availability: What you see is all there is – or not looked for</th>
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<tr>
<td>Alternative blindness</td>
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<td>Alternative paths</td>
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<td>Availability heuristic</td>
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<td>Black swan</td>
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<td>False causality</td>
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<td>Feature Positive Effect</td>
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<td>Illusory correlation</td>
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<td>Primacy and Recent Effects</td>
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<td>Single cause fallacy</td>
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<th>Representativeness: biases in assessing relatedness A to B</th>
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<tr>
<td>Association bias</td>
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<tr>
<td>Average problem effect</td>
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<td>Base rate neglect</td>
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<td>Beginner’s luck</td>
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<td>Chance</td>
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<td>Clustering illusion</td>
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<td>Coincidence</td>
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<td>Conjunction fallacy</td>
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<td>False consensus effect</td>
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<td>Intention-to-treat error</td>
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<td>Neglect of probability</td>
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<td>Outcome bias</td>
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<tr>
<td>Regression towards the mean</td>
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<tr>
<td>Survivorship bias</td>
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<td>Salience effect</td>
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<td>Self-selection bias</td>
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<td>Small numbers effects</td>
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<tr>
<td>Self-serving bias</td>
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<td>Swimmers body illusion</td>
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<th>Anchoring and Adjustment: biases in judging due to prior exposure or unnecessary adjustment</th>
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<td>Anchoring effect</td>
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<td>Cherry-picking evidence</td>
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<td>Conjunction fallacy</td>
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<td>Duration neglect</td>
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<tr>
<td>Distinction bias</td>
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<tr>
<td>Exponential growth</td>
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<td>Forer effect</td>
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<td>Falsification of history</td>
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<td>Framing Effect</td>
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<td>Focusing effect</td>
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<td>Hard-easy effect</td>
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<tr>
<td>Hyperbolic discounting</td>
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<td>Observation-selection bias</td>
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<td>Simple logic</td>
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<td>Paradox of choice</td>
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<td>Time-saving bias</td>
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<td>Will Rogers Phenomenon</td>
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<tr>
<td>Zero-risk bias</td>
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</table>
It is not difficult to observe at an IMT..

- **Availability heuristic**
  - WYSIATI (D Kahneman) The answer must be in front of me
    - where is it?
  - Black swan effect
  - Feature positive effect
    - The curious incident of the dog in night
  - Tunnel vision

What data / investigations are we missing? What don’t we know, we don’t know?
It is not difficult to observe at an IMT..

- **Representativeness: A related to B**
  - Coincidence / chance
  - Small numbers effect
  - Salience effect
  - Regression towards the mean

Based on the available evidence are our interpretations valid?

What is the strength of our assumptions?
It is not difficult to observe at an IMT.

• Anchoring & adjustment
  – Anchoring – reduced from squillions to just over priced
  – Base rate neglect – what was there to begin with
  – Framing effect – dressing up/down
  – Observer selection bias
  – Oversimplifying causality – what is different about this one
  – Hindsight bias

Give someone else the facts without opinions and ask for an interpretation? Where are you likely to misinterpret?
Communication & other bluffs & biases

- Story bias
  - It just fits nicely
- Diagnostic sufficiency... stop looking (but... Multiple causes)
- Ah... that's BECAUSE
  - Twaddle tendency
  - Nonsense
- Rhyme as reason bias
  - ‘if the glove don’t fit’
- Authority bias
  - Desk Thumpers
  - Halo effect
  - ‘S/he never gets it wrong’
Further compounded by….

• Confirmation bias
  – stick on first theory regardless

• Semmelweis effect
  – reject new evidence if it disagrees with established paradigms

• Unwillingness to be questioned / unapproachable

• Action bias
  – Need to be seen to be doing something

• Group think
As a consequence... we are vulnerable

• Being wrong in our assessment of the situation
• Preventing people who have more accurate situation awareness from speaking up
• Ergo we make wrong decisions (sometimes)

How to ensure a safety culture?
Ethos: Act to eliminate errors
#Hello my name is…
Make a Humble Inquiry (Schine)
(relationships in Obk mgmt are interdependent – not just hierarchical)

I am leading this outbreak – however if you feel that any mistakes or misinterpretations are being made please feel free and comfortable to interject

Get the team’s Situation Awareness
Ask: where could our SA be wrong?
If we are wrong what will happen?

Deploy a shark – find our mistakes
If we expect to make mistakes we are more likely to spot them, before...
You need **tools**…

- To demonstrate you practice optimally
- For the safety of people/animals

- CDC not producing any more guidelines – just tool kits!
Winging it is not a strategy

Good Strategy  Bad Strategy
Richard Rumelt
High Reliability Theory – Weick et al 2008

- Deference to expertise
  - Consulti non-experts (self)

- Sensitivity to operations
  - Fail to comprehend risks

- Reluctance to simplify
  - Quick to decide and stick

- Commitment to resilience
  - Content with the status quo

- Pre-occupation with failure
  - Blames front line workers
Never start with the idea of changing culture. Start with the issues facing the (patients/people/animals) organisation.

Edgar H Schine
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Stop transmission;
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prevent recurrence
Detection
From clinical, lab, surveillance
data, find outbreaks if present
Where are you most vulnerable?

Checklist & algo
Emerging Threats
(quarterly report)
Obk epi – what outbreaks happen where

Trigger Tools
Rare outbreak tools
Debrief Tool
SBAR
Outbreak workshops

Local surveillance
guidance & local surveillance
Get ready, find outbreaks if present
We are vulnerable: to cognitive errors, loosing situation awareness and making the wrong decisions

Ergo: we must recognise our error potential, design in safety, ergonomics and an ethos: act to eliminate errors