Southern African Journal of Anaesthesia and Analgesia. 2021;27(6 Suppl 1):S90-93
https://doi.org/10.36303/SAJAA.2021.27.6.S1.2717

South Afr J Anaesth Analg
ISSN 2220-1181 EISSN 2220-1173

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Patient safety and the anaesthetist

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All physicians have an ethical duty towards their patients to protect them from harm (nonmaleficence) and to do what is in their best interest (beneficence). This, in essence, relates to patient safety. Many patients have the expectation that the health profession should function without ever making a mistake. In reality, medical professionals are also humans and humans make mistakes.

A safer healthcare system depends on awareness about the vulnerability of the entire system. Critical incident analysis provides an opportunity to identify areas of concern and to institute corrective measures even in cases where a critical incident did not result in harm.[1,2] Anaesthetists should be trained in understanding cognitive processes related to decision making, as well as the potential errors that can occur in the system and in themselves. They should recognise the possible contributors to cognitive errors and develop ways to mitigate those risks. Institutions should have policies in place to avoid system errors that can lead to individual errors and subsequent patient harm. It is everyone's responsibility to ensure proper team management, leadership, assertiveness, communication, collaboration, professionalism, and self-reflection.[3,4]

Keywords: biases, cognitive errors, crew resource management, dual process thinking, heuristics, metacognition, normalisation of deviance, system 1, system 2

Cognitive processes

Kahnemann[5] describes a dual process thinking model and divides cognition into system 1 and system 2. System 1 is the fast thinking system where the cognitive process is continuously engaged without us being consciously aware of it. It is an intuitive process that happens automatically and, in its basic form, aims to preserve life by constantly assessing threats and acting within milli-seconds to avoid harm. System 1 thoughts are known as heuristics or mental shortcuts. It allows for decisions that need to be made repeatedly to become automatic with time. The benefit of system 1 thinking is that it saves time because it allows decisions to be made without spending time and mental energy to analyse everything. It can be observed in the difference in time spent between a trainee and an expert when performing the same task. The trainee still needs slow system 2 thinking to acquire a certain skill or make certain decisions while the expert can perform them automatically. System 1 processes only act on the very limited information that is immediately available in a 'what you see is all there is' way. This makes system 1 thinking prone to biases and false beliefs.[5]

System 2, or slow thinking, is the process that is followed when the problem is more complex. It needs critical thinking before making a decision. Critical thinking is defined by Paul and Elder[6] as 'The mode of thinking – about any subject, content, or problem – in which the thinker improves the quality of his or her thinking by skilfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them'. This means that system 2 thinking is intellectually conscious and invests time to see a broader picture than what is available to system 1 processes. Critical reasoning is necessary when dealing with a more complex patient or situation. In preparing patients for an anaesthetic, critical thinking is necessary to make an assessment of the patient and to develop an anaesthetic plan. While a lot of processes during anaesthesia happen automatically, the anaesthetist has to remain mindful (system 2 engagement) throughout the anaesthetic.[5]

Medical errors

Error is defined as the failure of a planned action to be completed as intended; or the use of a wrong plan to achieve an aim.[2] Medical errors can occur either because of a lack of knowledge or because of a cognitive error. It can also be divided into active errors (human factors) or latent errors (system errors) depending on the time at which the error occurred. Active errors tend to be committed by individuals and are usually picked up immediately. Latent errors do not directly cause the critical event, but happen sometime before the actual error. Examples include the infrastructure and layout of the operating theatre, equipment failure, unavailability of drugs or disposables, inadequate human resources, and organisational constraints. Latent errors predispose to active errors.[7]

Cognitive errors occur when someone has the knowledge but there was a problem in the way this knowledge was applied. It does not correlate with intelligence and occurs in novices and experts alike. People may incorrectly see themselves as free of bias (Blind spot bias).[8] Being aware of our biases can help to develop skills to 'debias'. Cognitive biases are universal to all aspects of life and there are a few important ones related to anaesthetic practice.[8-11] (Table I) One of the most common cognitive errors is overconfidence bias. The group that is most prone to overconfidence bias is the less experienced group.

Table I: Examples of cognitive biases

Anchoring	Focusing on initial salient points (anchor) and neglect to alter perception as new information becomes available. *Busy doing a peripheral nerve block (anchor) and not recognising that the blood pressure (BP) is very low.*
Fixation error	'This and only this' error occurs when the physician/team only consider one diagnosis. *Patient develops significant hypotension after spinal anaesthesia and the diagnosis is spinal hypotension, missing the fact that the patient actually has an anaphylactic reaction to the antibiotics.* 'Anything but this' error occurs when one has not even included the cause in the differential list. *This cannot be malignant hyperthermia as the patient is too old.* 'Everything is OK' error occurs when the problem is not acknowledged. *'My patient is hypoxic but no need to call for help. Once I am able to intubate, the hypoxia will resolve. No need to worry about the pneumothorax at the moment'.*
Authority bias	Tendency to rely on the opinion of an authority figure rather than to consider other options. *The senior consultant thinks we will be able to intubate this patient without the need for awake fibre-optic intubation.*
Availability bias	Recent events are recalled easily and are preferentially favoured or incorrectly seen as more important. *In the recent COVID-19 pandemic, respiratory symptoms are often attributed to COVID-19 without giving other possible causes the same priority.*
Base rate neglect	True prevalence rates in a specific population or under specific conditions are ignored and a patient managed as if they don't belong to that specific population. *'Peter has broken different bones four times already. Children with osteogenesis imperfecta (OI) suffer multiple fractures. Peter must have osteogenesis imperfecta'. In reality, the prevalence of OI is really small compared to unaffected children who break their bones. Peter is more likely to be unaffected by OI.*
Confirmation bias	Practitioner having a preconceived diagnosis and selectively interpret/notice information in a way that supports their diagnosis. Evidence that refutes may not be noticed. *Believing that the low BP reading must be due to incorrect cuff size, or patient movement and choosing to find an alternative to measure BP rather than to treat the actual hypotension.*
Commission bias	In an attempt to prevent harm, unnecessary investigations/procedures are being done. *Requesting a routine preoperative blood gas on all patients 'just to be safe' may cause an arterial injury.*
Omission bias	Tendency towards inaction driven by the nonmaleficence principle. *Delay in doing a front-of-neck access procedure because it is so invasive and maybe I will soon be able to oxygenate.*
Diagnosis momentum (bandwagon effect)	A preliminary diagnosis gets repeated by multiple people until it is seen as the definite diagnosis without other possibilities being excluded. *Thabang complains of chest pain after a motor vehicle accident. He was cleared by the trauma team. The intern admits the patient to the ward as a soft tissue injury with a laceration that needs to be repaired by the plastic surgeon. The patient complains of worsening chest pain and the intern asks the surgeon when they would repair the laceration on the guy with soft tissue injury. Thabang dies shortly thereafter due to an expanding pneumothorax.*
Framing effect	The way in which information is presented (framed) may influence the decision maker's perception. *Someone may refuse a treatment because it is presented as having a 1% failure rate but would have accepted the same treatment if it was 'framed' as having a 99% success rate.*
Familiarity principle	Prefer something just because one is familiar with it and disregarding something else that may actually be more beneficial to the patient. *Anaesthetists familiar with using 22G cutting edge spinal needles may continue using it even when 26G pencil point spinal needles are available.*
Feedback bias	Interpreting 'no feedback' as positive feedback. *Believe you never had a patient that developed surgical site infections, but you never actually followed up patients postoperatively.*
Overconfidence bias	Tendency to act on incomplete information, on a hunch or intuition due to inflated sense of one's abilities. *Not calling for help with anaesthetising a complicated case because of the belief that you can manage on your own.*
Premature closure/search satisficing	Accepting a plausible diagnosis before it has been fully verified and stopping to consider other diagnoses. *Assuming that a pregnant patient who presents with generalised tonic-clonic seizures has eclampsia and missing an overdose of tricyclic antidepressants.*
Sunk cost	Unwillingness to let go of a diagnosis or procedure because of all the effort already invested in such a diagnosis or procedure. *'We have ordered blood for this patient because we thought she might bleed. Now she didn't bleed and the blood will go to waste so we might as well give her the blood.'*

Normalisation of deviance

Critical incident analysis identifies the root causes of errors and informs recommendations on how such errors could be prevented in future. Standards, policies, and guidelines are subsequently developed. When reviewing major disasters such as the Challenger and Columbia accidents, the Chernobyl disaster, as well as catastrophes in patient care, a clear pattern emerges. It consistently involves errors by multiple people who are committing multiple seemingly innocuous mistakes that are not in line with policies of the institutions and eventually results in major disaster.

Practical drift is defined as the uncoupling of clinical practice from written policy. The primary cause of practical drift is acceptance of deviant behaviour. The term 'normalisation of deviance' was first coined by Diane Vaughan[12] who studied the report of the Challenger space shuttle disaster. She recognised multiple instances of small missteps that in themselves did not cause major harm, flawed assumptions and a culture of risk taking. This fits in with the 'Swiss cheese model' described by James Reason.[1] The slices are multiple layers of safety measures put in place by institutions, but can be influenced by latent errors leaving 'holes' in the cheese. When these latent errors line up and active errors occur, it leads to a critical event. This is also observed in health care.

People start to deviate from known standards and guidelines for various reasons including shortcuts to save time or because they think the rules are stupid/inefficient, that the rules do not apply to them, or even that they are breaking the rules for the sake of their patient. The deviation doesn't result in any known harm and the offender keeps deviating from the point. Other people observe this deviation and the deviated pattern gradually becomes the norm. People within the institution may believe that what they do is the correct thing because 'everybody does it' or 'nobody does it' and since it hasn't resulted in harm, they assume it is safe.

People of authority often start a deviation that is then picked up by trainees. There may be a reluctance from onlookers to point out the deviance for fear of retaliation, a belief that it is not their job to say something or simply not feeling confident enough to go up against someone of authority. People may be afraid that exposing deviant behaviour will put themselves or their unit in a bad light in a case of 'politics triumphing over safety'. It is important to note that the people within a deviant system usually do not have malicious intent. The safety culture is broken and people start to accept more and more errors and risks. They ultimately get to a point where something is no longer seen as a safety violation.[13-16] (Table II)

Table II: Examples of normalisation of deviance practices in anaesthesia

Removing vital monitors before a patient is fully awake and extubated
Lack of full ASA monitoring when doing peripheral nerve blocks
Silencing alarms or decrease the volume of alarms
Failure to monitor neuromuscular blockade properly
Disregarding infection control measures
Handing over a patient to a colleague at a critical time such as induction, extubation, etc.
Not checking expiry dates on drugs
Failure to adhere to strict sterile precautions during invasive procedures
Drawing up multiple syringes for subsequent patients
Failure to maintain 'cold chain' procedure

Factors that can predispose to cognitive error

Decision readiness is influenced by factors both in the individual and the system in which they function. People who are under emotional stress or fatigued or inexperienced in decision-making skills are more prone to errors. They may be bombarded with a lot of information that leads to cognitive overload. Someone's attention and ability to recall memories may fail them in a crisis situation. Affective considerations from an over-emotional anaesthetist may allow their compassion to cloud their decision-making skills, or an angry surgeon may force the decision to go ahead with surgery even when it puts the patient at risk. Some people are more prone to risk-taking behaviour. Pressure to get through a surgical list may create time pressure with insufficient time spent on important aspects such as: preoperative assessment, choosing the quickest anaesthetic method, or sending a patient to recovery room when they are not yet ready to be left in the hands of lesser skilled colleagues. Time pressure is also a factor in critical events where delays in diagnosis or management can result in harm to the patient. The anaesthesia environment creates a high-stake environment where a patient can actually die within minutes as opposed to some critical events in other industries where harm sometimes occurs months or even years later. It is a dynamic system where the condition of the patient can rapidly change; and where the treatment goals may not always be clear. It is important for the anaesthetist to be able to focus during a critical event and distractions interrupt the focus process. Some distractions are necessary when they add additional information pertaining to the case but it predisposes to cognitive overload and loss of focus.

Ways to reduce the risk of error

There are various ways that are proposed to help decrease risk and they have been used with variable success. The first of these strategies is to train people so that they become aware of their own cognitive processes and risks of bias. Metacognition is literally 'thinking about thinking'. Metacognition allows the anaesthetist to recognise their own shortcomings in memory as well as self-reflection on what went wrong and to think about strategies to prevent the error from happening again. Slowing down strategies require the anaesthetist to pause before making a decision and to ask themselves whether they have considered alternative options and whether the opposite option has been considered, and whether this decision is influenced by cognitive errors. Also consider whether there are any 'must not miss' alternatives that resemble the current case. Second opinions or group decision making will allow for a more objective approach. Checklists have become a popular method to remind the professional of important points. Guidelines and algorithms should be available for emergency scenarios and should be prominently displayed for easy reference. Simulation training assists in developing type 1 heuristics that can save time in an emergency, or to serve as an availability heuristic when faced with the same emergency.[4]

Management of the team is important. NASA's crew resource management programmes are implemented in various industries such as aviation and medicine. A leader who understands the situation and is able to effectively manage subordinates should be identified. Everyone should be encouraged to be assertive and to report deviations from protocol. Other important factors are communication, situational awareness, coordination, problem-solving and decision-making skills.[3] Institutions are responsible for ensuring management of infrastructure, equipment, drugs, disposables, human resources and proper processes.

Conflict of interest

The author declares no conflict of interest.

Funding source

No funding was required.

Ethical approval

No ethical approval was required.

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