# Learning to make better clinical decisions

***To achieve the optimum patient outcome one must be able to choose the most appropriate course of action. How this choice is made may not be actively contemplated, and there may be many unrecognized pitfalls for the unwary. An increased awareness of how we think should increase both the efficiency and success of clinical decision making.***

There are many theories on how clinical decisions are made, and all have advantages and disadvantages. An awareness of the dual processes of analysis and intuition increases the accuracy of decision making (Norman and Eva, 2010).

It is possible to interpolate the steps in the decision-making process based on established principles of cognitive bias. Prerequisite preliminary steps are to identify the problem, objective and context. The subsequent path depends on factors such as the availability of time, experience, existing evidence and ethics.

The analytical route of decision making dominates when there is more time available than experience. Analysis follows an hypothetico-deductive approach: generating an hypothesis, accumulating information, establishing relevance, associations, options, strengths and weaknesses, and probabilities before evaluating and ranking the options to reach a decision. Intuition relies on recognizing cues.

Both analysis and intuition can lead to each other and analysis can follow iterative cycles before reaching a decision. Decisions to act then culminate in outcomes which feedback to refine experiential memory and improve the efficiency of intuition.

## Intuition *vs* analysis

There are two main ways in which decision making is approached: intuitively and analytically (Stanovich and West, 2000). Intuition uses experience and judgement to recognize associations and patterns, whereby cognitive dispositions to respond (i.e. 'rules of thumb') are established and refined through experience (Croskerry, 2005). Intuition is an holistic goal-oriented rapid reaction; a good approach when dealing with uncertainty and readily adaptable according to the situation. It delivers the most acceptable solution whereby operational demands dictate that a prompt decision is required.

A limitation in the use of intuition in decision making is its inability to be globally applied ('one size does not fit all'). Thus it allows for variation in cognition and can introduce error, but there is the advantage that it does allow for subtle anomalies or nuances to be detected thus allowing a 'short cut' in the decision-making process to be made. Intuition can also be limited by user experience where there is:

- Mismatch between experience and situation (expertise is problem specific, e.g. 'to a hammer every problem is a nail'),
- Recall distortion (having faded experience, e.g. 'this is the way it's always been done'),
- Obsolescence (being out of date, e.g. 'if it isn't broken don't try to fix it').

The analytical method of decision making is a process-oriented criterion-based systematic reflection. It permits iterative cycles of evidence evaluation and so effectively compensates for inexperience. This technique relies upon hypothesis testing, review of existing and new evidence, and hence analysis of all available information, at each decision step. Unfortunately reaching the optimal solution can be slow, inflexible and is associated with high cognitive loading. Whichever method is adopted, other factors may also play a role in the decision-making process such as society protection, cost effectiveness and compliance with the decision taken. In such cases, the analytical route, being stepwise in methodology, allows for the use of external influences to aid decision making such as opinions from multidisciplinary teams (Bhugra et al, 2011).

## Steps to making the optimum clinical decision

Reaching a clinical decision, whether via the intuitive or analytical routes, involves a multi-step process. A variety of cognitive biases can influence which path is taken (Gilovich et al, 2002). However, three preliminary steps can be identified which are common to both approaches of decision making (*Figure 1*).

## Prerequisite preliminary steps

The presenting problem needs to be identified and clearly defined. Second, a desirable target objective needs to be identified as an achievable goal. Control bias (the inappropriate estimation of ability to influence the outcome) is a potential problem that can influence the objective. For example, in deciding whether a patient with dementia (the problem) is deemed mentally competent (the objective), control bias could be introduced if the patient's confusion varies in a diurnal nature and thus the outcome could vary according to when the patient underwent testing. Deciding whether a patient is competent involves assessment at a point in time (it is a threshold concept). At some point in the patient's life the threshold from competence to incompetence has been crossed (Muramoto, 2011). This threshold (the control bias) influences when a patient is deemed mentally incompetent (the objective) (Kruger and Dunning, 1999).

Third, the context needs to be identified. Determining the breadth and depth of information required and resources available (i.e. situational characteristics) frames the conditions under which the decision will be made. Context is subject to the potential for framing bias. Framing bias leads to a different conclusion just because of how the information is pre-

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sented (Tversky and Kahneman, 1981), i.e. perspective predicts preference. This factor is particularly relevant when using evidence-based practice as an aid to clinical decision making, especially in psychiatric patients. For accurate interpretation, correlation with a patient's symptoms is required and thus is reliant on subjective reporting implying introduction of error or bias (Bhugra et al, 2011). In psychiatric patients, symptom reporting is highly variable and can be inaccurate leading to errors in deciding on management. This has potential consequences for society leading to malpractice claims (Bhugra et al, 2011). It follows that the path to an effective clinical decision follows either an intuitive or analytical route depending on the availability of both time and experience as deduced from the context.

## Analytical cycle of steps

Cognitive reasoning plays a key role in the analytical part of decision making. It involves the use of all available information, previous learning experience, intuition and hypothesis testing. When there is a lack of experience but time is available it is possible to hypothesize. Analysis of the unfamiliar is thus used to formulate a proposition. Data acquisition (e.g. via questioning, examining, testing) is essential for hypothesis testing. However, accumulating information is subject to the potential for availability of evidence bias, which in turn leads to information not being represented equitably. For example recent past cases, rare cases, media coverage or personal experiences are remembered more easily and hence their likelihoods are overestimated (Tversky and Kahneman, 1974).

The next step is to consider the relevance of the information which has been accumulated. The pertinence of information needs to be interpreted to determine what should influence the decision, and is subject to potential obedience bias (the reliance on information from authority figures or investigations without establishing their validity (Milgram, 1963)). Thus, when using data from evidence-based studies, the applicability of the data to a particular patient may not be appropriate (Bhugra et al, 2011). This has to be borne in mind by the inexperienced clinician, as he/she is more likely to use evidence-based practice to aid clinical decision making.

Further analysis of the acquired data involves identifying associations in the data via the recognition of converging and divergent facts. However, there is a potential for representativeness bias overestimating the probability of belonging to a particular group; giving more weight to a collection of typical features than an atypical feature (Tversky and Kahneman, 1974).

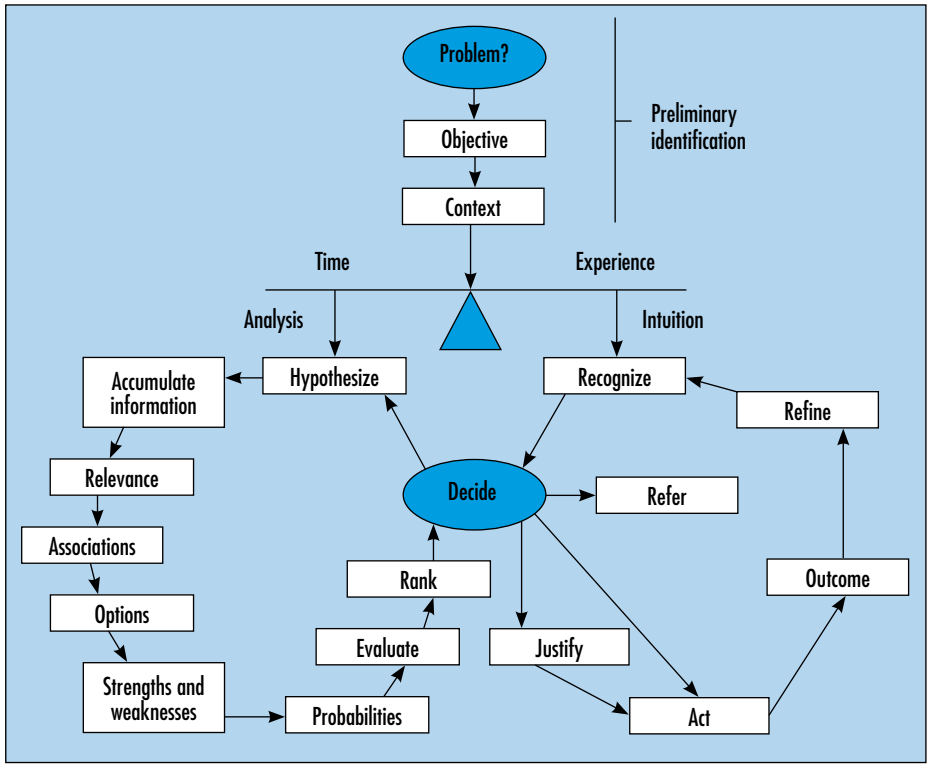
Once associations have been established then options can be listed as potential alternative solutions. The options listed are subject to the potential for anchoring bias (an overemphasis on 'first impressions', i.e. not readjusting the relevance of information in the light of new evidence (described as conservatism by Phillips and Edwards, 1966)). The strengths and weaknesses of each option can be similarly listed by considering the advantages and disadvantages of each alternative including potential risks based on feasibility (Rennard and Vestbo, 2011).

Strengths and weaknesses are subject to the potential for aversion bias (giving inappropriate emphasis to what might be lost or gained so as to avoid risk (Kahneman et al, 1990), which in turn is influenced by both the unknown and dread (Slovic, 2000)). The probabilities for all strengths and weaknesses need to be inferred from predictions based on likelihoods (e.g. frequency of disease) taking into consideration the sensitivity and specificity of tests.

At this point data using confidence intervals are useful as they provide a more formal and rigorous measure of whether the value of two actions or decision outcomes is statistically significant (Shortreed et al, 2011). Confidence interval interpretation helps reduce base rate neglect bias, i.e. the under-estimation of small probabilities and over-estimation of large probabilities (Kahneman and Tversky, 1979).

It is then necessary to evaluate the relative importance of the various options based on the probabilities of their advantages and disadvantages using critical thinking. The level of acceptable risk is often specific to the individual and varies with time (i.e. not 'one size fits all' (Krebs, 2005)). The choices need to be balanced against each other, taking into account patient preference, scientific data, health, economic, social, cultural, ethical and any other relevant considerations. However, during the evaluation process there is a risk of introducing a confirmation bias in favour of information supporting expectation (i.e. 'wishful thinking' (Wason, 1960)). This is a problem when interpret-

***Figure 1. The decision pathway.***



ing studies published in journals. Inadequate hypothesis testing, inappropriate data analysis including breaches to study protocols (as seen in retrospective studies) and 'data massaging', false data presentation and invalid data interpretation can influence how such information is acted upon in the decision-making process both by the clinician as well as the public.

Evaluation results in a rank of the options, prioritized in order of acceptability (e.g. impact on welfare). Ranking is subject to the potential for order bias. Order bias is focussing on information at the start (primacy effect (Deese and Kaufman, 1957)) or the end (recency effect; described as the peak-end rule by Kahneman (1999)). The final step is to decide on the best course of action. The ranking of options naturally presents the best course of action, with others being relegated as contingencies. All things having been considered then what appears to be the best course of action at that point in time is chosen (*Figure 2*).

The decision needs to be mutually agreed (Gulland, 2011) with patient consent (unless a substituted judgement is necessary). If there is insufficient information to reach a decision then the process is repeated starting with a new hypothesis or modification of the old hypothesis (to increase understanding of the problem). Alternatively, the problem is referred to another person for a second opinion.

However, consideration has to be given to the risk of adopting a paternalistic view when using this equation. This is clinically evident in 'do not resuscitate' orders, whereby the decision is based on whether a patient is likely to be successfully resuscitated and whether his/her quality of life post resuscitation is likely to be fulfilling.

This paternalism is taken further in the 'Physician Orders for Life Sustaining Treatment (POLST), adopted in the USA. Here, specific information from the patient is used to guide clinicians in the decision making should a patient develop a life-threatening illness. Paternalism occurs when the clinician has the 'permission' to modify treatment as conditions dictate (Muramoto, 2011). The point of decision is subject to the potential for closure bias. Closure bias is reaching a decision without all of the key information (premature closure, making an adequate rather than optimal choice was described as satisficing by Simon, 1956), or too long after all of the key information became available (delayed closure). These can occur as a result of being over-confident or under-confident respectively. Invoking action while still uncertain is referred to as activity bias (i.e. 'doing something rather than nothing') and increases the propensity of false positives. Closure is motivated by a need for both certainty and satisfaction (Small and Venkatesh, 2000).

***Figure 2. The balance that needs evaluating for each option before reaching a decision.***

$$\text{Likelihood of deciding to act} = \frac{\text{Need of benefit / Risk of harm}}{\text{Resources needed}}$$

## Intuitive steps

Given experience and/or lack of time, the next step in reaching a decision is to recognize cues such as those obtained from clinical investigations (Fajans and Bell, 2011). The familiar is recognized by intuition, identifying the best fit in memory in order to reach a decision. For example an experienced clinician would recognize that a patient presenting with weight loss and gives a history of good appetite, frequency of micturition and thirst is likely to have a diagnosis of diabetes mellitus, while a novice would 'sieve' through a list of specific questions pertaining to certain possible diagnoses (e.g. tumour, dietary alteration, infection).

The rationale (whether by evidence base, existing guidelines or experience) behind such a decision can then be justified either before or after action is taken. This would lead ultimately to an outcome. Following the success or otherwise of the outcome there is a need to refine experiential memory in order to improve pattern recognition. A reflection on the outcome and decision-making process leading to that particular outcome results in the modification of memory recall to increase future efficiency. Intuition therefore becomes the primary mode of decision making with experience.

## Integrating intuition and analysis

Intuition and analysis are not separate approaches to decision making, but are integrated as two mutually supportive systems (Facione, 2011). Intuition is based on pattern recognition, depending on experience and memory. With experience, lists of the presenting signs and symptoms encompassing a particular problem develop into automatically recognized scripts (Schmidt et al, 1990) indicative of outcome. This primarily depends on multiple coordinated representations in memory of causal mechanisms and prior examples of problem outcomes (Norman, 2005).

Thus a clinician experienced in dealing with similar problems continuously refines his/her ability in order to make faster and more accurate decisions (Kassirer et al, 1982), via the use of intuition based on matching the current situation to an expanding bank of previous analytical experience. Sometimes there are definitive indicators (i.e. pathognomonic signs and symptoms) representing exemplar schemas of practice. However, caution has long been recommended before making decisions based on such schemas (Janeway, 1884). For example risus sardonicus leads immediately to the diagnosis of tetanus, but can occur more rarely under other conditions (e.g. strychnine poisoning).

Intuition is most frequently used to prioritize and minimize unnecessary detail, appropriately manage risk and intervene, or not, in the face of incomplete information and rationed resources (such as time or equipment). Complexity reduces the likely relevance of previous experience and so can be expected to increase the propensity to improvization. In such situations where expertise is lacking, the emphasis shifts back to analysis.

Analysis is based on hypothetico-deduction, depending on knowledge of probabilities and causal relationships (Kassirer, 1989). However, refinement of the analytical process is compromised by the fact that usually we can never know for certain how a particular patient would have fared if an alternative decision was made. Not all patients fit a single model. There are consequences for getting it wrong, however, and caution must be taken for professionals not to be bound by rigid protocols if they are to make decisions efficiently. This is one of the pitfalls in protocols drawn up for health-care providers. Strict adherence to protocols (which may only be based on limited evidence or financial constraints) can hinder adaptability to particular situa-

tions (e.g. anti-thromboembolic prophylaxis may be appropriate for general orthopaedic patients but not necessarily in patients of a different ethnicity or those who undergo spinal surgery).

Protocols and computer-assisted decision support systems can aid decision making but this ultimately depends on human intervention. After all an algorithm, which guides a decision, is only as good as the information inserted initially. Wherever possible the most difficult 'high stakes' decisions should rely on a consensus such as found following multidisciplinary meetings to partly share responsibility and minimize liability. The value of such meetings in devising guidelines to aid management is well documented in the palliative care and cancer literature (Devitt et al, 2010). However, cognitive biases can still be overlooked even when an experienced team is involved (Kahneman et al, 2011). Nevertheless evidence indicates that an increased awareness of the dual processes of intuition and analysis leads to small improvements in decision-making accuracy by individuals (Norman and Eva, 2010).

## Tips to minimize bias in clinical decision making

It is clear that when evaluating evidence in order to reach a decision we can be misled by many different cognitive biases. A greater awareness of potential biases should minimize errors in decision making:

- Estimate the initial probability carefully (is the available evidence balanced, in context and representative)
- Weight evidence only by merit (avoiding ordering effects, anchoring, confirmatory effects and remember negative findings can be as valuable as positive findings)
- Challenge dogma (establish the basis of others' opinion, consider the sensitivity and specificity of measured values).

No one method is superior to the other when making clinical decisions. Paramount to all is the need to maintain ethical standards. Any model that is used needs to be adaptable and obey the tenets of good ethics (i.e. autonomy, beneficence, non-male-ficence, justice, dignity and honesty). All theories on decision making are based upon a single point in time and are not necessarily as adaptable as they purport to be. External cues and a pragmatic approach should be considered but at the same time care is needed not to be too paternalistic as this would override autonomy (Muramoto, 2011). Needless to say it is important to develop awareness, reflection and self-monitoring in order to make optimal decisions and consequently maximize clinical outcomes. Learning to use metacognition (i.e. thinking about thinking) enables us to reflect on the reasons for choosing a particular course of action, minimize the influence of biases on our judgement, and develop a more efficient intuitive approach so as to make better clinical decisions. **BJHM**

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## KEY POINTS

- Understanding the integration of intuition and analysis improves the accuracy of decision making.
- Intuition depends on recognizing patterns and is limited by experience mismatch, recall distortion and obsolescence.
- Analysis depends on hypothesis testing and is time consuming and inflexible, with a high cognitive load.
- Established cognitive biases can be organized to reveal a decision pathway which can be used to avoid predictable common mistakes.
- Ultimately, care should be taken to ensure all clinical decisions comply with ethical principles.