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Decision making in perceived devastating brain injury: a call to explore the impact of cognitive biases

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Advances in critical care medicine have led to an increase in the number of patients who survive the initial phase of critical care. For these survivors, the impact of brain injuries on the probability of regaining consciousness, further cognitive disability, and more generally speaking, their overall quality of life is tremendous. Currently, most patients with acute brain injury that die early following injury, expire in the context of limitation or withdrawal of life sustaining treatments (WLST) ¹. Decisions that shift the goals of care to aim for WLST are typically driven by discussions between caregivers and families about the likely patient's outcome. However, accurate prediction of recovery in a brain-injured patient is extremely challenging, especially during the acute phase. Timing and willingness to pursue WLST varies greatly, but if built on prognostic uncertainty, carries a high risk of promoting a self-fulfilling prophecy bias ².

To guide physicians taking care of patients with severe acute brain injury, the Professional Standards Committee of Faculty of Intensive Care Medicine and the Intensive Care Society published in this issue of the British Journal of Anaesthesia their joint statement ³. The authors are specifically addressing the subgroup of acutely brain injured patients for which outcomes are thought to be unlikely to be compatible with a "good outcome", a scenario they gave the label of "Perceived Devastating Brain Injury" abbreviated as DBI. The authors provide a number of practical and helpful recommendations in the spirit of providing maximal medical support during the early phase following acute brain injury (within the first hours). As doubts are raised by the medical team to continue life support, the authors argue that full medical support should be continued for another 24 to 48 hours before initiating any WLST allowing for better detection of the rare patient that is able to "go on to make a good recovery despite very poor early prognosis signs".

We agree with the authors' interpretation that this prescribed "stand-by window" would ensure that judgments on prognosis that are shared with the family are grounded at

least on a minimum amount of information, such as more than one clinical assessment and accumulation of recommended prognostic measures. Although providing details for the comprehensive prognostic approach were beyond the scope of this consensus statement, the authors should be commended for recommending a minimum framework allowing for more accurate prognostication such as the use of pathology specific prognostication scales and the integration of a “neurosciences team” in this decision making process.

For most common life-threatening conditions of patients with DBI, the application of the “stand-by window” will realistically result at a minimum in an admission of to an ICU. In addition to improved neurological prognostication, this extended observation window would provide more time for open discussions with families. This stronger relationship may decrease stress among relatives and also consequently increase acceptance for organ donation, when applicable. On the other hand, additional stress and traumatizing experiences may be created for families and staff by these protracted, heart-wrenching discussions. This concern needs to be acknowledged as healthcare workers as well as family members need to be provided with better access to appropriate resources to cope with the resulting stress.

The statement emphasizes fundamental ethical aspects such as respecting patient preference as a primary goal of care and the need to take into account the global social and health-system context. In the multi-cultural environments encountered world-wide particularly in the modern urban metropolis, health care professionals need to take into account the diverse cultural context of each patient when approaching these sensitive discussions. This is challenging and may require tailored training.

When compared to the recent US consensus statement ⁴, DBI definition is less restrictive than the one used in the American consensus statement (where DBI stands for “Neurological injury where there is an immediate threat to life from a neurologic cause”) as it includes survival with poor or no functional recovery. The suggested observation time-window

(24 - 48h) is also significantly smaller than in the American consensus statement (72h). It is further noteworthy that the American consensus statement is more restrictive in their DBI criteria and permissive in term of observation time, giving in that sense more time to assess potentially more severely ill patients. However, these time frames are more dictated by practical considerations of bed availability than any fundamental scientific basis. The ideal time-window is unclear and should be determined according to each individual case in the context of the available resources and the underlying pathophysiology.

What “good outcome” are we trying to predict?

An interesting issue raised in the statement is the kind of prediction we talk about. As underlined by the authors, predicting in-hospital mortality is not sufficient. Both clinicians and society are increasingly asking for more accurate prediction of long-term disability and ideally of quality of life. The definition of what constitutes a poor outcome is controversial ^{5 6}, but usually lumps vegetative and minimally conscious state, and in a more variable extent, severe disability together with death. This may include levels of recovery where patients are unable to experience social relations, require continued medical assistance, etc.

Predicting long-term recovery of consciousness and cognitive recovery at an early point in time, which may occur several months or even years after brain injury, is enormously difficult and inaccurate at this time ⁷. Moreover, over such a long time-scale, patient and relatives’ conception of what is a “good outcome” often change dramatically. This value change may occur in either direction. Consequently, the most relevant “perceived” outcome may not be the “here-and-now” judgment, but the “there-and-later” estimation by patients and relatives. Despite much recent progress and several on-going studies, for now and probably many years to come, caregivers would have no choice but to accept an inherent amount of uncertainty while making decisions in these scenarios.

The statement provides a potential framework for future research suggesting to not study mortality rate as an outcome whenever possible and to rather focus on disability or quality of life. This is not novel but needs to be stated for these extremely sick patients. The confounding effect of a self-fulfilling prophecy is minimized by this approach, even if, as mentioned in the statement, one could argue that outcome can even be worsened by inappropriate care based on incorrect prognostication among survivors.

Potential other solutions will involve creative integration of clinical and scientific communities, providing generalized data sharing enabling long term pooled analysis, and the use of more integrated study designs closer to real-world clinical practice and the design of “pragmatic trials”^{8 9}. It is encouraging to see that an international group of experts has joined forces with support from the J.M. McDonald Foundation under the leadership of Nicholas D. Schiff from Weill Cornell Medical Center to collect a large sample of brain injured patients with acute and chronic disorders of consciousness with the goal of developing more accurate prognostication tools and gain insights into the recovery process.

Psychological issues in neuro-prognostication

We would like to initiate a discussion about the fundamentals of the decision-making process as it relates to decisions for WLST in acute brain injury, which is notably not discussed in this statement (and only briefly mentioned in the American consensus statement). The chosen acronym “DBI” (standing for “*perceived* Devastating Brain Injury”) assigns this condition a label, which corresponds less to a patient’s condition and more to the supposed future neurological recovery of the patient. This future state is based on the prediction of the medical team which is illustrated by the adjective “perceived” as well as the provided definition: “Any neurological condition that is *assessed* at the time of hospital admission *as* an immediate threat to life or incompatible with good functional recovery and where early limitation or withdrawal of therapy is being *considered*”. Although this particular definition

can be misleading (especially when the acronym DBI loses its “*perceived*” adjective in the text) it is noteworthy that this consensus statement mainly concerns a “real life” clinical situation (integrating the on-going cognitive processes into the caregiver’s minds) than a classically nosological entity. We think this semantic distinction is of prime importance since we know how far off our current prognostication tools are from being perfect, especially when applied within the first 72 hours of acute brain injury. Despite this, caregivers leading WLST discussions are typically overly pessimistic and frequently inaccurate in predicting outcomes^{2 10 11}.

Prognostication of the outcome of perceived DBI can be a very complex process holding contradictory elements of variable uncertainties. In such complex situations, we have known for decades that many “decisional short-cuts” can lead toward systematic and predictable errors known as ‘cognitive biases’¹². Cognitive biases can be viewed as the cognitive equivalent of visual illusions at the perceptive level (revealing how information can be processed erroneously). The field of medicine is no exception¹³. The availability bias for instance (i.e., the tendency to make judgments of likelihood based on the ease of recall rather than on actual probabilities), tends to make us think first about a rare diagnosis we recently experienced (being more heavily influenced by a recent patient, or data seen at a conference that we just returned from). This may still cloud our judgment even if we consciously know that the case or data pertained to a very rare diagnosis.

There is a growing interest in studying the impact of these biases on diagnostic and therapeutic decision making^{14 15}. Unfortunately, studies on how biases affect prognostication are scarce but the existing data is alarming. Neurologists with expertise in stroke care estimating the probability of key clinical outcomes such as mortality or disability at discharge have been shown to fall within the 95% CI of the actually observed outcomes in less than 20% of cases¹⁶.

Many biases may cloud the judgment of a physician or a healthcare team member providing a prognostic assessment including availability bias, confirmation bias, anchoring or framing effect (for details please refer to Table 1). For instance, prognosticating recovery of a DBI patient, we can error in two fundamentally different directions: (1) Predicting a good prognosis for a patient that would actually have a bad outcome (e.g. permanent vegetative or minimally conscious state for example). (2) Predicting a poor prognosis, that will lead to a WLST, in a patient that could have actually recover with a good outcome. Both errors may have dramatic consequences that we would like to avoid. However, there is a fundamental difference between these two scenarios: in the second case the patient generally dies after a WLST decision and the ground truth will remain unknown. In other words, it will be impossible to know if our prognosis was actually correct or wrong. This is not true for the first type of error, where distraught family members may confront us with the inaccuracy of our prediction should the patient not recover.

The loss aversion effect (our tendency to view losses as larger than corresponding gains) may bias towards decisions that prevent the risk of discovering that we were wrong. We do not run this risk when giving a poor prognosis. Loss aversion can lead to contradictory cognitive contents if evidence does not fit perfectly a poor prognosis generating a state of “mental discomfort” (called cognitive dissonance) ¹⁷. To minimize this discomfort, we may be tempted to unconsciously readjust the weight of each line of evidence in order to better fit the poor prognosis. Framing effect and confirmation bias may lead us to overestimate pejorative elements and minimize the good ones, while substitution bias results in prognostic overconfidence (Table 1). Scrutinizing the decision making process with insights gained from cognitive psychology allows us to better understand and minimize the impact of systematic biases that may lead us to more proactively argue for WLST. The first step in the right direction is being aware of the neuropsychological driving forces of decision making at the

Table 1. Common cognitive biases that may underlie systematic errors in neuro-prognostication of patients with devastating brain injury.

Cognitive bias	Description	Example
Confirmation bias	to look for or to interpret evidence to support prior hypothesis rather than look for disconfirming evidence.	looking for evidence to support the presumed prognosis rather than contradictory elements.
Availability bias	judgments of likelihood or percentages based on ease of recall (greater "availability" in memory) rather than on actual probabilities.	overestimate the likelihood of a prognosis based on a recent experience with a similar case.
Anchoring effect	to rely heavily on one piece of information when making decisions (usually the first piece of information acquired: the "anchor").	focusing on salient features in the patient's presentation too early in the prognosis process and failing to adjust this initial impression in the light of new information.
Framing effect	to draw different conclusions from the same information, depending on how that information is presented.	allowing the way evidence is framed or whom the information came from to influence prognosis making.
Loss aversion	to view losses as looming larger than corresponding gains.	continue with a given prognosis, even though it may not fit the new evidence (avoiding the loss of "being right").
Attribute substitution	answering a complex, difficult question by substituting it by a related but simpler one.	translate a legitimate high confidence in diagnosis elements into an overconfidence on prognosis issue.
Sunk-cost effect	to allow previously spent time, money, or effort to influence present or future decisions.	overestimation of a good prognosis if a lot of resources (typically surgery or organ supply) have been successful (in term of short outcome).
Dunning Krüger effect	tendency for unskilled individuals to overestimate their own ability ("illusory superiority") and the tendency for experts to underestimate their own ability.	being over confident in a prognosis in case of a lack of knowledge in this specific field (in comparison to expert).
Bandwagon effect	to do (or believe) things because many other people do (or believe) the same	rely too much on apparent consensus and/or common practices.
Commission bias	to favour action rather than inaction.	jumping to a withdrawal of care procedure (+/- organ donation) rather than just giving more time to get more information.
Blind obedience	to show undue deference to authority or technology.	relying too much on a unique expert opinion or test result.

individual but also the group level¹⁸. This kind of approach was elegantly illustrated in the recent article by Braxton and colleagues outlining cognitive biases leading to an overinvestment in futile therapeutics at the end of life in the ICU setting¹⁹.

Consensus statements are crucial even in the absence of high quality data as they provide a generally agreed upon framework to guide management and decision making

processes in these extremely stressful life-and-death decisions. However, we think that both the present and former American statements only go halfway. The stand-by window should depend on the underlying pathophysiology but likely should be enlarged. Beyond the scope of these consensus statements, experts need to demand development of reliable and accurate prognostic tools to guide decision-making processes for these fragile patients. Lastly research into and training of health care professionals in recognizing and coping with the impact of biases on decision-making needs to be supported. This heightened awareness of the dangers of cognitive biases for decision-making will hopefully encourage physicians to better use available prognostic tools and to develop new computerized clinical decision support systems

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Declaration of interest

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