Letter to the Editor

Title: An implicit bias in error management?

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We read with interest the article by Cuschieri[1], which described human errors in surgery as "random unintended events" (p. 642) that need to be accounted for not only when they are fatal but also when they are hidden as 'near misses' or 'no harm' events. There is much to be learned from errors that go unnoticed, but we wonder whether they can always be described as random or unintended.

Biological psychologists argue that evolution has engineered humans with implicit safety mechanisms that operate by managing errors systematically beneath consciousness. Error Management Theory (EMT)[2] proposes that when survival threatening (fatal) errors are possible, people unconsciously tailor their actions to errors with the least costly outcome. For instance, a mother who loses her child, prematurely raises the alarm (a false positive error), rather than wait passively for the child to return (a false negative error); the cost of waiting is potentially far higher than the inconvenient, but ultimately less costly, strategy of prematurely raising the alarm.

Importantly, EMT suggests that when the costs of a false negative error are greatest systematic biases to commit false positive errors emerge, and vice-versa. Females, for example, display commitment-skepticism when choosing a partner, thus showing a bias for false negative errors in which they underestimate a male's interest; presumably, the extended demands of motherhood inflate the cost of choosing a partner who is not truly committed to fatherhood. [2,3] Males on the other hand show a bias for false positive errors in which they overestimate a female's interest; the costs of rejection might be inconvenient for males (and possibly embarrassing), but no opportunity to procreate is wasted. Similarly, the high costs of illness have caused the evolution of overly sensitive disease-avoidance behaviours; long after the 2003 SARS outbreak abated in Hong Kong, people continued to wear face masks.

EMT may also explain implicit biases for some types of errors in potentially unpredictable environments, such as the operating theatre. We found that experienced laparoscopic surgeons (> 100 procedures) asked to replicate the exact length of an incision without visual feedback displayed a systematic underestimation bias. It appeared that removal of feedback caused surgeons to commit false positive errors because they had the lowest error cost (i.e., an incision can be lengthened but cannot be shortened).

So why in surgery do avoidable high cost errors sometimes recur (e.g., laparoscopic bile duct injuries during cholecystectomies[4])? Commentators have voiced concerns that on occasion surgeons may have a "false perception of their abilities" [5] or a sense that "this can't happen to me".[6] Such attitudes may result in conscious disregard for the behavioural responses that implicit error management mechanisms invoke.

How then can we bolster implicit error management mechanisms so that surgeons are able to consistently display systematic biases for the least costly error? Although previously we have argued that it is disadvantageous to make the implicit, automated motor components of technical skills conscious (explicit)[7, 8, 9, 10], in the context of error management it might be advantageous to raise the awareness of the surgeon. In this respect, Way and colleagues[4] argue that the bias to sometimes disregard information that disconfirms a decision in surgery may "respond to educational efforts that spell out and explain the significance of the specific disconfirmatory findings" (p. 467).

In laparoscopic cholecystectomy, surgeons are often explicitly advised to obtain cholangiograms as a precautionary measure.[4] Although this prolongs a procedure it is a trivial inconvenience compared to the costs associated with an error that results in a bile duct injury. A cognitively more efficient method of 'spelling out' rules that help surgeons to commit the least costly errors may be to devise fast and frugal heuristics (e.g., "measure twice, cut once" [11]) specifically for procedures in which it is unclear whether a false positive error or a false negative error will result in the least costly behaviour. Fast and frugal heuristics[12] are simple rules of thumb that can be called to mind rapidly and effortlessly, use only the information immediately available in the environment, and yet can be implemented to make correct decisions when time and cognitive resources are limited, as is often the case in the operating theatre.

Error Management Theory suggests that human errors are not always random and unintended and warrants consideration when evaluating the underlying cause of errors in modern surgery. A greater understanding of unconscious error biases in surgery may inform training curricula and impact on the quality of surgical healthcare.

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