even in the absence of outcome data, we suggest using troponin as the primary criteria for identifying clinically significant myocardial injury in all perioperative settings.

We respectfully disagree with Archan *et al.*[1] regarding the relevance of differentiating between myocardial injury and myocardial infarction. They correctly point out that troponin elevation may result from a variety of etiologies, including physiologic stress associated with marathon running or mountain climbing.[5] Furthermore, the extraordinary sensitivity of currently available biomarker assays permits detection of a single troponin molecule release even after minimal exercise.[6] At present, however, imaging modalities and cellular detection technology are unable to differentiate between troponin release from the cytosol or damaged cells that are likely to recover (myocardial injury) and irreversible cellular necrosis (myocardial infarction). Therefore, we suggest that increased concentrations of circulating troponin, in fact, reflect a spectrum of myocardial injury. Consequently, the assignment of a specific cutoff point in an attempt to differentiate between injury and infarction may be counterproductive to efficient identification of therapeutic interventions.

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On Memory, General Anesthesia, and Sleep

To the Editor:

I read with great interest the erudite editorial that accompanied the article by Pham *et al.*[2] by my colleague, Professor Lichtor.[1] In their article, Pham *et al.*[2] found no evidence of implicit memory formation during anesthesia in children.

Without providing clear and concise answers, Lichtor[1] asks the following question: *Is memory formation during anesthesia similar to what goes on during sleep?* General anesthesia abolishes explicit or conscious memory except in the rare cases of awareness during anesthesia.[3] The evidence for memory formation beyond unconsciousness is controversial. It may occur only during light anesthesia, short of consciousness.[4] When it occurs, there is only evidence of perceptual, but not conceptual, priming.[5] As for sleep, Lichtor[1] notes there is evidence that it contributes to the consolidation of some types of explicit memory. There are also some reports that it enhances the learning of motor and perceptual skills.[6]

Lichtor[1] asks another question: *Would patients have better postoperative control of pain and anxiety if therapeutic instructions are given both preoperatively and intraoperatively?* My answer has to be negative. For patients to comprehend instructions during anesthesia, there must be conceptual priming, which does not occur during anesthesia—except at its lightest levels (*e.g.*, nitrous oxide, opioids, and muscle relaxants),[7] where conscious encoding of stimuli is still possible.[5] After a 1988 report that claimed improved recovery and reduced hospital stay for patients after surgery,[8] nearly all credible and controlled studies failed to replicate this finding or other beneficial findings relating to postsurgical analgesia, nausea and vomiting, cessation of smoking, and so on.[9] The suggestion by Lichtor[1] that anesthesia might be similar to sleep processes that facilitate memory consolidation cannot be true because anesthetics abolish memory by *suppression* of consolidation.[10–12]

Finally, although Hermann Ebbinghaus introduced many important ideas and methods for memory research (with himself as the sole subject) in the late 19th century, I would attribute the introduction of implicit or nonconscious forms of human memory to the literature at a much later date. The first suggestion that conscious or implicit memory exists was in 1957, when Scoville and Milner reported the case of patient H.M., who after surgery for epilepsy was unable to convert a new short-term memory into a permanent long-

The above letter was sent to the authors of the referenced report. The authors did not wish to reply.—James C. Eisenach, M.D., Editor-in-Chief.

term memory.[13] He could, however, learn new motor skills without any awareness that he had ever before performed the tasks. Research into implicit memory exploded in the early 1980s.[13]

The above comments should not, however, obscure my agreement with my colleague's outstanding statement that, "although there are some similarities between anesthesia and sleep, general anesthesia is not really the same as sleep."

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