

# NEUROLOGY

**Late recovery from the minimally conscious state: Ethical and policy implications**

Joseph J. Fins, Nicholas D. Schiff and Kathleen M. Foley

*Neurology* 2007;68;304-307

DOI: 10.1212/01.wnl.0000252376.43779.96

**This information is current as of July 21, 2007**

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.neurology.org/cgi/content/full/68/4/304>

Neurology is the official journal of AAN Enterprises, Inc. A bi-monthly publication, it has been published continuously since 1951. Copyright © 2007 by AAN Enterprises, Inc. All rights reserved. Print ISSN: 0028-3878. Online ISSN: 1526-632X.





# Late recovery from the minimally conscious state

## Ethical and policy implications

Joseph J. Fins, MD; Nicholas D. Schiff, MD; and Kathleen M. Foley, MD

**Abstract**—We consider the ethical and public policy implications of late recovery from the minimally conscious state in light of an Institute of Medicine exploratory meeting convened to discuss current knowledge about disorders of consciousness as well as a recently published study demonstrating axonal regrowth in a patient two decades after traumatic injury. Participants at the meeting (which included the authors) described a lack of research initiatives for basic investigations of patients in these states, the frequent warehousing of patients following a diagnosis of persistent vegetative state that limits their access to appropriate neurologic and diagnostic tests, and the breadth of public confusion about disorders of consciousness. Meeting participants encouraged the Institute to pursue a more formal study to outline both the need for research and the unique opportunities to study consciousness, now available through the use of neuroimaging and related technologies. Areas of initial focus would be to define the epidemiology of the minimally conscious state, elucidate mechanisms of recovery, and identify clinically useful diagnostic and prognostic markers that will aid decision making at the bedside.

NEUROLOGY 2007;68:304–307

**Brain injury after Schiavo.** If America was confused by the Terri Schiavo case, how will it respond to new knowledge about disorders of consciousness and the capability of the brain to recover in the face of overwhelming injury? The Schiavo case was contested against unimpeachable evidence that she would never recover. In that case, the science was clear: Recovery from vegetative state (VS) produced by anoxic brain injury categorically does not occur 15 years after injury.<sup>1,2</sup> Such a VS is permanent and immutable with widespread neuronal loss and degeneration of the brain.

Yet, even with such evidence, there was a national debate about the likelihood of her recovery. This in turn influenced the perceived ethical propriety of removing her feeding tube and allowing her to die.<sup>3,4</sup> Notwithstanding the ideological forces that exploited that family tragedy,<sup>5</sup> the public remained confused by the paradox of the “wakeful unresponsiveness” that is pathognomonic of the VS.<sup>6</sup> Images of Ms. Schiavo appearing to look at her mother were confounding to the untrained eye, though postmortem studies demonstrated complete interruption of the

visual pathways and cortical necrosis, confirming expert clinical examination.<sup>7,8</sup>

With these issues in mind, the Institute of Medicine (IOM), supported by the Dana and Greenwall Foundations and the American Neurologic Association, convened an exploratory meeting to discuss current knowledge about the disorders of consciousness, including the VS and the minimally conscious state (MCS). Assembled for the first time on this topic were scientists, physicians, policymakers, attorneys, and medical ethicists, including the authors. Participants at the meeting described first a lack of research initiatives for basic investigations of patients in these states, second the frequent warehousing of patients following a diagnosis of persistent VS that limits their access to appropriate neurologic and diagnostic tests, and third the breadth of public confusion about disorders of consciousness. Meeting participants encouraged the IOM to pursue a more formal study to outline both the need for research and the opportunities to study consciousness.

In addition to the IOM activity, a group comprising scientists, clinicians, and policymakers (includ-

From the Division of Medical Ethics (J.J.F.), Department of Neurology and Neuroscience (N.D.S., K.M.F.), Weill Medical College of Cornell University and Memorial Sloan–Kettering Cancer Center (K.M.F.), New York.

Supported by the Charles A. Dana Foundation (J.J.F. and N.D.S.) and the Buster Foundation (J.J.F.).

Disclosure: Drs. Fins and Schiff are the recipients of grant support from the Dana Foundation.

Received July 21, 2006. Accepted in final form October 19, 2006.

Address correspondence and reprint requests to Dr. J.J. Fins, Division of Medical Ethics, New York Presbyterian–Weill Cornell Medical Center, 435 E. 70 St., Suite 4-J, New York, NY 10021; e-mail: jffins@med.cornell.edu

ing two of the authors) met and are currently preparing a report for the U.S. Congressional Brain Injury Task Force, which will include a research and policy agenda.

**The minimally conscious state.** Given the confusion about Ms. Schiavo's relatively straightforward case of catastrophic anoxic brain injury and permanent VS, how will the public react to the scientifically more complex picture that is beginning to emerge for MCS? MCS, first described in 2002, is a "condition of severely altered unconsciousness in which minimal but definite behavioral evidence or environmental awareness is demonstrated."<sup>9</sup> Although these behaviors are intermittent, patients demonstrate unequivocal evidence of consciousness and may demonstrate attention, intention, and memory. They may purposefully track objects in their visual field and even communicate. These MCS behaviors contrast with those of VS in which there is no awareness of self, others, or the environment.

In contrast to the prognosis of the permanent VS at 1 year following traumatic brain injury, some patients who reach MCS at that interval may have the potential for noteworthy additional recovery, although emergence to a state of more consistent consciousness and use of language can take months or years in rare cases.<sup>10,11</sup> Cases of patients who began to recover long after injury are now sporadically making headlines<sup>12-14</sup> and causing confusion because media reports and public comments often make no distinction between VS and MCS.<sup>15-18</sup> One result is heightened expectations for recovery from the permanent VS and the revisiting of the Schiavo case.

The conflation of these brain states is understandable but never excusable,<sup>19</sup> precisely because MCS patients are demonstrably conscious and may have a life of the mind, although this remains speculative. It is the prospect for recovery that is most intriguing and important, as was demonstrated in a *Journal of Clinical Investigation* article published in July 2006.<sup>11</sup> The article presents quantitative structural and functional neuroimaging data from a subject who remained in what is now defined as MCS following a severe traumatic brain injury for 19 years prior to a sudden and sustained recovery of fluent language. The study used diffusion tensor imaging (DTI), a method of mathematical analysis of MRI data that measures the restriction of the motion of water molecules. With use of these measurements, it is possible to infer the geometry of the white matter connections of the brain as water motion is tightly restricted within these internal cables of the brain.

DTI measurements revealed widespread destruction of brain fiber integrity globally consistent with diffuse axonal injury (DAI) produced by shearing forces applied to the head at the time of the accident. In addition, and surprisingly, in light of the aggregate evidence of severe DAI, large areas of increased fiber connections were inferred from measurements of white matter in the parietal-occipital regions

(measured as anisotropy, a quantification of the restriction of water motion). In a second study 18 months later, these areas were observed to reduce their anisotropy and preferred directionality (also measured quantitatively using information contained in DTI measurements). In the second study, a marked increase in anisotropy was observed within the cerebellar white matter, and these findings correlated with improved motor function across the interval between these two points in time.

Based on these quantitative data and recent studies in the experimental literature, it was proposed<sup>11</sup> that sprouting of new axonal connections may have played a part in the subject's recovery. The findings suggest a potential biologic mechanism for late recovery in patients with DAI (but may not play a role in other patients with different underlying etiologies of brain damage), a hypothesis that requires further testing in many patients. It is, however, unlikely that slow axonal regrowth is the sole explanation for the changes observed in the subject. Additional factors that influenced the patient's recovery remain unknown. Among other plausible mechanisms that could have influenced increased behavioral responsiveness was the introduction of pharmacologic neuromodulation (paroxetine) approximately 2 years prior to his recovery of speech. However, this is a speculation.

**Studying Terry Wallis.** This observation challenges long-held dogma about the immutability of the injured brain to recover and regenerate. Terry Wallis, the subject of the *Journal of Clinical Investigations* study, made front-page news around the world when he began to speak in 2003, and his story has been well chronicled.<sup>11,13</sup> The family's reported observations that suggested that he was following a command or purposefully tracking an object in his visual field were dismissed as wishful thinking rather than useful clinical evidence. These observations did not outweigh the "authoritative" diagnosis of VS received on hospital discharge and never re-evaluated.<sup>20</sup>

Before MCS entered the medical lexicon in 2002,<sup>9</sup> the Wallis family was told that such behaviors were not possible in the VS. His father's requests for a neurology consult and an imaging study were also denied. Mr. Wallis was told it would be too expensive and unhelpful for his son (J.J. Fins and N.D. Schiff, personal communication). Sadly, such a societal "neglect syndrome"<sup>21</sup> continues for many patients with severe brain injury once they are discharged from acute care facilities and placed into what is euphemistically described as "custodial care." It has been estimated that the diagnostic error rate of MCS patients as persistent VS may be as high as 30 to 40%.<sup>22-24</sup>

Although the Florida Supreme Court<sup>25</sup> and the independent *Guardian Ad Litem* appointed by Governor Jeb Bush<sup>26,27</sup> affirmed Ms. Schiavo was in the VS, the risk of misdiagnosis remains for others.<sup>18</sup>

The VS cannot be generalized to all severe disorders of consciousness, even though that might allow us to avoid the ethical ambiguity of dealing with intermediate states and uncertainty.<sup>21</sup> Neurobiology is not so dichotomous, and families can look at the same fact patterns and arrive at different decisions about care, invoking pluralistic values.

Mr. Wallis's family are pleased to have him back from a two-decade absence that ended so improbably. Others might not accept life emerged from the MCS with such physical and cognitive impairments. These concerns are profound and without simple solutions.

Each patient is different—with clinical and narrative nuances that will have to be understood and weighed before clinicians can reasonably recommend and families decide about the nature of care. Our point is that decisions to continue or withdraw life-sustaining care should be ones of either an informed consent or an informed refusal. They should be informed by our best scientific knowledge of the patient's diagnosis and prognosis and the patient's prior wishes, if they are known. Nothing less will suffice as developments in neuroscience begin to reveal mechanisms of recovery and diminish our clinical and moral certitude about a "right" course of action.

#### **IOM meeting on disorders of consciousness.**

The IOM meeting participants confirmed the lack of a national research agenda for this population. At a minimum, we need to assess the criteria for diagnosing and differentiating persistent VS and MCS, delineate this epidemiology, consider the utility of specific diagnostic imaging modalities to assess consciousness, and develop better prognostic markers.

This challenge should engender enthusiasm. After all, tracking the recovery of consciousness in the severely injured brain is an extraordinarily compelling scientific opportunity that is now within reach because of advances in neuroimaging and related technologies. A small number of studies using functional imaging techniques already indicate differential activation patterns in VS vs MCS patients,<sup>28</sup> and tracking brain structure as well as function have been suggested to be clinically useful in tracking recovery.<sup>11</sup>

With a modest investment, future studies may well elaborate the basis for consciousness in the human brain and provide diagnostic and prognostic information that will prove helpful to clinical decision making at the bedside. Confounding variables like the heterogeneity of brain states and the sensitivity of neuroimaging measurements need to be interpreted against basic clinical information and epidemiologic data about the natural history of recovery. Such data can temper observations and guide the design of methodologies to longitudinally assess and track patients as their brain states evolves.

Although such epidemiologic data are essential,

there is very little of it. To date, no prospective studies of MCS incidence or prevalence have been carried out, and it remains nearly impossible to locate MCS patients currently dispersed throughout the health care system. A national registry of such patients is critically needed. This would include incidence and prevalence data about patients as their brain states evolve as well as where these patients reside within the health care system (e.g., hospital, rehabilitation program, nursing home, or home). At the clinical level, we need to know how these diagnostic distinctions are being made and who is seeing these patients across the continuum of care, for example, internists, psychiatrists, vs neurologists, and the differential quality of their clinical assessment. Such basic data are necessary to bring needed services to this population and engage them in research studies. Currently, the best estimate of the number of MCS patients between 112,000 and 280,000 is from a study extrapolated from a heterogeneous group of pediatric patients.<sup>29</sup> There is no information about venue of care.

This will be the first step in identifying the scope of this public health need and the infrastructural investment necessary to bring neuroscientists in academic medical centers and patients residing in chronic care in closer proximity to allow for research to proceed and clinical care to improve.<sup>30</sup> Such engagement is currently hampered by economic pressures for early discharge from acute care and specialized neurorehabilitation,<sup>31,32</sup> the geographic isolation of patients outside of the acute care system, and the ethical challenge of doing research on those who are decisionally incapacitated, especially when the object of study is why informed consent is unobtainable.<sup>30</sup>

Overcoming these barriers will be difficult but is essential if translational work is to get done for this population that has been marginalized and sequestered from clinical research. Pointedly, the fate of those with severe brain injury has been described as a "silent epidemic."<sup>33</sup> It is indeed ironic that despite all the attention generated by the Schiavo case, so little interest has been directed toward the needs of this underserved population.

#### **References**

1. The Multi-Society Task Force on PVS. Medical aspects of the persistent vegetative state (2). *N Engl J Med* 1994;330:1572-1579.
2. Jennett B. *The vegetative state*. New York: Cambridge University Press, 2002.
3. Quill TE. Terri Schiavo—a tragedy compounded. *N Engl J Med* 2005;352:1630-1633.
4. Fins JJ. *A palliative ethic of care: clinical wisdom at life's end*. Sudbury, MA: Jones and Bartlett, 2006:48-53.
5. Annas GJ. "Culture of life" politics at the bedside—the case of Terri Schiavo. *N Engl J Med* 2005;352:1710-1715.
6. Jennett B, Plum F. Persistent vegetative state after brain damage: a syndrome in search of a name. *Lancet* 1972;299:734-737.
7. Medical Examiner. District Six. Pasco and Pinellas Counties. Available at <http://www.sptimes.com/2005/06/15/schiavoreport.pdf>
8. Fins JJ, Schiff ND. The after-life of Terri Schiavo. *Hastings Center Report* 2005;35:8.
9. Giacino JT, Ashwal S, Childs N, et al. The minimally conscious state: definition and diagnostic criteria. *Neurology* 2002;58:349-353.

10. Lammi MH, Smith VH, Tate RL, et al. The minimally conscious state and recovery potential: a follow-up study 2 to 5 years after traumatic brain injury. *Arch Phys Med Rehabil* 2005;86:746–754.
11. Voss HU, Ulug AM, Dyke J, et al. Possible axonal regrowth in late recovery from the minimally conscious state. *J Clin Invest* 2006;116:2005–2011.
12. Smothers R. Injured in '88, officer awakens in '96. *New York Times* February 16, 1996; <http://query.nytimes.com/gst/fullpage.html?sec=health&res=9B05E1D71239F935A25751C0A960958260>.
13. Schiff ND, Fins JJ. Hope for “comatose” patients. *Cerebrum* 2003;5:7–24.
14. O'Connor A. Brain-injured fireman's recovery takes science into a murky area. *New York Times*, May 4, 2005; p. B-1.
15. Zimmer C. What if there is something going on in there? *New York Times Magazine*, September 28, 2004; pp. 52–56.
16. Fins JJ, Giacino JT, Hirsch J, et al. Letter to the editor. *New York Times Magazine*, October 19, 2003; p. 12.
17. Didion J. The case of Terri Schiavo. *New York Review of Books* 2005;52:60–69.
18. Fins JJ. The Terri Schiavo case: an exchange. *New York Review of Books* 2005;52:63.
19. Fins JJ, Plum F. Neurological diagnosis is more than a state of mind: diagnostic clarity and impaired consciousness. *Arch Neurol* 2004;61:1354–1355.
20. Fins JJ. Rethinking disorders of consciousness: new research and its implications. *Hastings Center Report* 2005;35:22–24.
21. Fins JJ. Constructing an ethical stereotaxy for severe brain injury: balancing risks, benefits and access. *Nat Rev Neurosci* 2003;4:323–327.
22. Wilson FC, Harpur J, Watson T, et al. Vegetative state and minimally responsive patients—regional survey, long-term case outcomes and service recommendations. *NeuroRehabil* 2002;17:231–236.
23. Andrews K, Murphy L, Munday R, et al. Misdiagnosis of the vegetative state: retrospective study in a rehabilitation unit. *Br Med J* 1996;313:13–16.
24. Childs NL, Mercer WN, Childs HW. Accuracy of diagnosis of persistent vegetative state. *Neurology* 1993;43:1465–1467.
25. Supreme Court of Florida. No. SC04-925 Jeb Bush, Governor of Florida, et al., Appellants, vs. Michael Schiavo, Guardian of Theresa Schiavo, Appellee. September 23, 2004.
26. Wolfson J. Erring on the side of Theresa Schiavo; reflections of the special Guardian Ad Litem. *Hastings Center Report* 2005;35:16–19.
27. Wolfson J. Defined by her dying, not her death: the Guardian Ad Litem's view of Schiavo. *Death Studies* 2006;30:113–120.
28. Laureys S, Owen AM, Schiff ND. Brain function in coma, vegetative state and related disorders. *Lancet Neurol* 2004;3:537–546.
29. Strauss DJ, Ashwal S, Day SM, et al. Life expectancy of children in vegetative and minimally conscious states. *Pediatr Neurol* 2000;23:312–319.
30. Fins JJ. Clinical pragmatism and the care of brain injured patients: towards a palliative neuroethics for disorders of consciousness. *Prog Brain Res* 2005;150:565–582.
31. Banja J. Patient advocacy at risk: ethical, legal and political dimensions of adverse reimbursement practices in brain injury rehabilitation in the US. *Brain Injury* 1999;13:745–758.
32. Hoffman JM, Doctor JN, Chan L, et al. Potential impact of the new Medicare prospective payment system on reimbursement for traumatic brain injury inpatient rehabilitation. *Arch Phys Med Rehabil* 2003;84:1165–1172.
33. Winslade WJ. *Confronting traumatic brain injury: devastation, hope and healing*. New Haven: Yale University Press, 1998.

**Late recovery from the minimally conscious state: Ethical and policy implications**

Joseph J. Fins, Nicholas D. Schiff and Kathleen M. Foley

*Neurology* 2007;68;304-307

DOI: 10.1212/01.wnl.0000252376.43779.96

**This information is current as of July 21, 2007**

**Updated Information  
& Services**

including high-resolution figures, can be found at:  
<http://www.neurology.org/cgi/content/full/68/4/304>

**Related Articles**

A related article has been published:  
<http://www.neurology.org/cgi/content/full/68/4/248>

**Subspecialty Collections**

This article, along with others on similar topics, appears in the following collection(s):

**Coma**

<http://www.neurology.org/cgi/collection/coma> **All Ethics in Neurology/Legal issues**

[http://www.neurology.org/cgi/collection/all\\_ethics\\_in\\_neurology\\_legal\\_issues](http://www.neurology.org/cgi/collection/all_ethics_in_neurology_legal_issues) **Brain death**

[http://www.neurology.org/cgi/collection/brain\\_death](http://www.neurology.org/cgi/collection/brain_death)

**Permissions & Licensing**

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:

<http://www.neurology.org/misc/Permissions.shtml>

**Reprints**

Information about ordering reprints can be found online:

<http://www.neurology.org/misc/reprints.shtml>

