

LETTER TO THE EDITOR

Near-Death Experiences and EEG Surges at End of Life

To the Editor:

Lakhmir Chawla and colleagues (2009) reported that patients who were at end of life and had life support withdrawn—that is, no medications, IV infusions, or machine ventilation—exhibited a surge of electroencephalographic (EEG) activity just prior to complete arrest of blood flow and death. The researchers speculated that a similar surge of electrical brain activity may account for the near-death experiences (NDEs) of patients who suffer cardiac arrest but are revived. The observed EEG surges appear of sufficient duration and strength as to account for the vivid experiences reported in NDEs.

Of course, the immediate response to this conjecture is that many NDEs occur under conditions without these clinical circumstances (see Greyson, Kelly & Kelly, 2009), and, thus, the proposed connection does not provide a complete explanation of NDEs. Indeed, it is impossible to tell just what the deceased patient experienced in the final minutes of the dying process. Nevertheless, Chawla and colleagues reported that the presence of an objectively measured electrical signal at the time of death has been a source of comfort to many of the families of these patients, indicating that “something” happens at the time of death.

We propose an alternative explanation of this phenomenon.

In their end-of-life protocol, Chawla and colleagues used an EEG monitoring device placed on the patient’s forehead. The device analyzes the frontal cortical EEG signal and produces an integer score of the level of electrical brain activity from 0 (equivalent to EEG silence) to 100 (equivalent to fully awake and alert). These monitors are used primarily to track surgical patient anesthesia levels, where a value between 40 and 60 indicates an appropriate level for general anesthesia.

In each of the seven cases in their study, the patient’s loss of blood pressure after life support was withdrawn was followed by a decline in the monitored EEG activity, followed by a large transient spike in EEG activity approaching levels normally associated with consciousness. The EEG surge was short-lived—on the order of 1 to 5 minutes—

and the activity then declined to zero. In all cases, possible sources of electrical artifacts were ruled out. In one case, the researchers captured and analyzed the raw EEG signal and confirmed that the EEG waveform was not an artifact. In fact, a high frequency waveform was present during the EEG surge, indicating apparent gamma frequency electrical activity that is normally associated with consciousness.

Chawla and colleagues (2009) also reported these EEG surges in more than 20 other patients, where the timing of the surge was consistent but the results were not recorded on a monitor. Not all ante-mortal patients showed the surge of EEG activity. The researchers suggested a possible physiological mechanism for the observed EEG surge: that as the brain reaches a critical level of hypoxia, a large number of neurons lose the sodium-potassium ion potential, which causes a sudden cascade of electrical activity that yields the high frequency EEG signals. As the cells subsequently lose their resting potential, the electrical activity rapidly dissipates. More recently, Chawla (2011) reported that more than 100 similar end-of-life cases had now been collected, where about 80% of end-of-life patients showed an EEG surge.

Chawla and colleagues speculated that a similar situation to the withdrawal of life support occurs with patients who have cardiac arrest. They suggested that in these cases, a similar terminal surge in brain activity occurs that likely causes conscious experiences. The resuscitated patient recalls the experience associated with the surge, which could be what people describe as NDEs. The researchers noted that the strong, sudden electrical event that is observed in the EEG surge is consistent with the intense, vivid quality of the NDE.

Are End-of-Life EEG Surges a Sign of the Soul?

Stuart Hameroff and Deepak Chopra (2010a) commented on the Chawla paper that perhaps the end-of-life EEG surge *is* related to conscious NDEs or out-of-body experiences, but the patient is simply not revived. Many NDErs and some NDE researchers consider NDEs to be manifestations of consciousness, or the soul, leaving the physical body. It is conceivable that the observed high frequency gamma oscillations associated with consciousness involve very low-energy quantum entanglements that can persist while other brain functions have run out of energy. Consistent with the phenomenology of NDE, consciousness could continue to exist outside the body and remain in a quantum-entangled state as a unified soul-like entity grounded in

Planck scale geometry. If the physical body is resuscitated, the quantum information can return, and the subject may report an NDE (Hameroff & Chopra, 2010b).

The notion that NDEs and other phenomena surrounding physical death are suggestive that “something”—the person’s consciousness or soul—leaves the physical body at death has been around for centuries and more recently in the research literature. For example, Peter Fenwick (2010) has suggested that consciousness loosens from the physical body near the moment of death and finally separates from it at death. It is not unreasonable to propose that the observed end-of-life EEG surges are similarly associated with the separation of the person’s conscious entity at the time of death.

In our view, however, the relationships among EEG surges, separation of consciousness, and NDEs are not completely straightforward.

With end-of-life protocols involving withdrawal of life support and subsequent death, it is impossible to tell just what a patient experiences in the final minutes. However, it is very possible that these patients are experiencing something like an NDE. In the shared death experience (SDE) that Raymond Moody described, persons who are in the presence of their dying loved one sometimes observe the process of dying in an altered state of mind (Moody & Perry, 2010). The people in attendance describe experiences such as rising out of their own bodies and seeing the out-of-body form of their loved one, hearing “heavenly” music, observing their loved one’s life review, seeing deceased relatives and transcendent beings, and traveling part-way toward the light with their loved one. These elements in SDEs are also present in NDEs and occur even though the shared death experiencer is physically fit. Moody (pp. 157–158) proposed that all extra-normal experiences involving the dying process—NDEs, SDEs and other experiences at the time of death—are connected in a continuum.

On the other hand, it is implausible that the end-of-life EEG surge is a *direct* cause of NDEs. Many NDEs occur under conditions without cortical ischemia or loss of cortical electrical activity, for example NDEs occurring with falls or accidents in which the subject is not seriously injured (for example, Heim, 1892) and NDEs occurring during physical trauma that does not involve loss of brain electrical activity, such as a car accident involving no head or other serious injury. At best, EEG surges may co-occur with NDEs in cases where surges are observed, similar to co-occurrences that are present in these other kinds of NDEs, but the surges do not completely explain the NDEs.

An Alternative Model of NDE and Consciousness

In other work (Mays & Mays, 2011), we have postulated that the mind is a non-material energetic entity with the ability to interact with physical processes. During an NDE, the energetic mind separates from the physical body and operates independent of it. While outside the body, the NDEr's mind retains all of the faculties of ordinary consciousness, including memory. Upon resuscitation, the mind returns and is reunited with the body.

There is considerable evidence from NDE accounts and phantom limb phenomena that the energetic field of the mind can interact with physical processes. Physical interactions reported during NDEs include direct interactions with physical processes (light, sound waves, fog and material objects) and with embodied persons (tickling the nose of a person and "merging" with the brain and body of another person). In addition, some evidence indicates that the NDEr's energetic "body" emits light that is visible to animals.

In this view, the fundamental aspect of the mind entity is the *localized individuality or being-ness* of the person. This aspect of the mind manifests throughout the NDE in the persistence of self-conscious awareness with a particular location and visual perspective. Deceased and transcendent beings whom the NDEr encounters also display localized, individual natures. In our view, the mind is a new fundamental aspect of reality, not a derivative of known physical principles.

The view proposed by Hameroff and Chopra is that consciousness can separate from the body and can continue to exist during an NDE and after death in a quantum-entangled state, as a unified soul-like entity. This view does not fit the evidence of direct interaction in NDEs with physical processes including cases where an NDEr's mind "merges" with an embodied person.

Despite the differences in the nature of the separated conscious entity, our view is in agreement with Hameroff and Chopra's basic premise: that the person's consciousness separates as an independent entity from the physical body during an NDE and at death.

The Missing 80% and the Missing 20%

The incidence of NDEs reported in the research literature has been quite variable. The generally accepted expected incidence is about 17% in prospective studies and 35% in retrospective studies (Zingrone &

Alvarado, 2009, p. 36). From the beginning of near-death studies, researchers have questioned why only about 20% or so of people report an NDE during physical trauma or illness. What happens to the other 80%? Why don't they report an NDE?

Similarly, we can now ask, what happens to the 20% of end-of-life patients who do not exhibit an EEG surge? Why don't they have an EEG surge when life support is withdrawn?

We believe it is likely that both phenomena are two sides of the same coin. If about 20% of people in general are predisposed in some way whereby their consciousness can readily loosen and separate from the physical body, then they will be likely to report NDEs, *regardless of the contributing factors*. This argument would explain why so many apparent contributing factors result in the same phenomenal experience of NDE. With a serious medical trauma or illness, such as at end-of-life, the consciousness of these 20% would separate from the physical body and be out-of-body most of the time. People who have been in coma have reported such experiences (Lawrence, 1997). During withdrawal of life support, the consciousness of these 20% would already be separated from their physical body, and the separation would then simply become permanent. Because their consciousness is already separated, there would not be the physiological response of an EEG surge.

On the other hand, the 80% of people who, for whatever reasons, are not predisposed for their consciousness to separate readily from the physical body would remain unconscious. When life support is withdrawn, the process of separation of their consciousness from the physical body takes place, which is recorded as an EEG surge. *Thus the EEG surge is a physiological indication of the separation of the conscious entity from the physical body at death* for the 80% of people who have not separated before then.

In this view, the connection between end-of-life EEG surges and NDEs is *complementary*, not causal. This proposal can be tested by a comparative analysis of the patients who have and don't have end-of-life EEG surges. We would expect that patients who would be predisposed to separate from their body would not exhibit an EEG surge, for example people who had a prior NDE, who exhibited NDE aftereffects, or who had other similar physiological and psychological attributes.

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