

1 **Studying death and near-death experiences requires neuroscientific expertise**

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**Abstract:**

17 Parnia et al.<sup>1</sup> recently published suggestions for the study of death and experiences recalled in a near-death  
18 context. We have serious reservations about the authors' statements. In this commentary, we discuss the  
19 omissions and knowledge gaps inherent to the authors' paper, which among others include incorrect  
20 neurological claims about brain death and misunderstandings regarding the terminology of consciousness.  
21 Although we believe that (near-)death research deserves a framework guideline, the paper by Parnia and  
22 colleagues is misleading and, contrary to the authors' intention, hinders the scientific understanding of near-  
23 death experiences and the neural mechanisms occurring in the dying brain.

24 **Keywords:** cardiac arrest, death, near-death experience, consciousness, responsiveness

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26 We read with interest the paper of Parnia et al.<sup>1</sup> aiming to introduce guidelines for the study of death and  
27 experiences recalled in a near-death context. We appreciate the authors' efforts in trying to analyze the  
28 difficulties that the field of (near-)death research faces. However, their proposed "consensus guideline"  
29 lacks empirical support for many of the authors' claims related to near-death experiences (NDEs) and  
30 includes incorrect statements about the underlying neurological mechanisms in the dying human brain.

31 First, the paper contains inaccurate, highly problematic neurological statements, foremost one that borders  
32 on a misunderstanding of the brain death concept:

33 "People [...] declared dead according to brain death criteria may not demonstrate  
34 histopathological evidence of brain cell death on autopsy. This suggests that [...] while the  
35 underlying [...] brain injury/disorder [may be] "irreversible," the biological/cellular point of  
36 irreversibility may not have yet been reached in some [of these people]" (p. 2 of File S1 from<sup>1</sup>).

37 This statement is wrong because it ignores the fact that brain death criteria explicitly require structural,  
38 destructive, and irreversibly fatal brain damage to be present and well-documented. Restated, a brain death  
39 protocol is stopped immediately when it is evident that repeated neuroimaging reveals lack of major cerebral  
40 injury, and thus neuronal cell death.<sup>2</sup> What the authors fail to clarify here is that not all cells in the brain die  
41 simultaneously, which explains that, for example, depending on the specific brain death protocols used,  
42 islands of cortical cells may show residual function as revealed by certain brain death cases with rudimentary  
43 EEG activity,<sup>3</sup> or rudimentary brainstem perfusion may be present when the documentation of absent  
44 intracranial circulation is not required.<sup>2</sup> Similarly, although the authors are correct that only 2% of people  
45 are declared dead according to brain death criteria, it is problematic when this information is not put into  
46 context: Every human death (in the biological sense) is ultimately brain death, regardless of the cause.<sup>4</sup> This  
47 lack of neurological precision is unfortunate. Accurate scientific definitions of the brain death and cardiac  
48 death concepts are indispensable in a paper aiming to describe and develop guidelines for the study of death.

49 Second, contrary to what Parnia et al.<sup>1</sup> write, people who recall NDEs are therefore inherently people who  
50 have not been dead and have not met brain death criteria. Since the introduction of brain death criteria in  
51 the 1960s,<sup>5</sup> not a single patient properly diagnosed as brain dead has come back to life.<sup>6-8</sup> All reports of  
52 "brain death mimics" (for examples, see<sup>9,10</sup>) have ignored the fundamental prerequisite for a brain death  
53 protocol that there has to be, as stated earlier, well-documented and irreversibly fatal brain damage.<sup>7</sup> Because  
54 of these scientific inaccuracies, the proposed term "recalled experience of death" is wrong and we firmly  
55 reject it. The authors confuse "death" with the process of dying:

56 "Anyone with a preserved mental state (state of consciousness during wakefulness) cannot be  
57 considered to have had a severe enough life-threatening disorder, and their experiences cannot be  
58 considered in relation to death or critical illness. Consequently, their experiences cannot be labeled  
59 using the terms "near-death" or NDE" (p. 10 from<sup>1</sup>).

60 Here, the authors make a logical fallacy. It is a prerequisite for being able to report an NDE that during the  
61 actual experience the person has had a functioning brain and has survived without extensive brain damage.  
62 Without a functioning brain, how would it be possible to have such a detailed experience, store it for long  
63 periods of time, retrieve it from memory, and then narrate it eloquently many years later?  
64

65 There is not a single empirical study with a sufficiently rigorous methodology to reliably confirm that people  
66 are able to report actual (real-life) events and details happening during e.g., cardiopulmonary resuscitation.  
67 In one of the most rigorous studies, Parnia and co-authors<sup>11</sup> claimed that 1 of 330 cardiac arrest survivors  
68 (i.e., 0.3%) reported some elements from the surroundings during his/her cardiopulmonary resuscitation.  
69 However, the authors' protocol did not allow to rule out the possibility that the report of that single person  
70 was a false memory, built in retrospect upon prior, unrelated memories and expectations.  
71

72 There is hence no "recalled experience of death"; if anything, it should be 'recalled experience of what  
73 might have been the start of the dying process just before consciousness was lost'.  
74

75 Third, the authors write that NDEs in post-cardiac arrest patients fundamentally differ from NDEs made in  
76 other life-threatening or non-life-threatening situations, and that the latter experiences are "mis-labeled".  
77 Again, the reasoning is flawed. There are no empirical data so far to indicate that the phenomenology of  
78 NDE differs in situations that are (a) associated with a threat to life and impaired brain physiology such as  
79 a cardiac arrest, (b) associated with a threat to life but unimpaired brain physiology such as a near-miss  
80 traffic accident, and (c) associated with non-life-threatening situations such as drug consumption or  
81 meditation. To the contrary, the data that do exist indicate that all these experiences are phenomenologically  
82 similar (e.g.,<sup>12-16</sup>). In other words, from the phenomenology of the experience one cannot tell if what  
83 happened was a cardiac arrest or e.g., use of a psychedelic drug. Contrary to what the authors state, this  
84 similarity suggests that the brain mechanisms behind these experiences are probably also similar, if not  
85 identical.

86 Fourth, the authors embark on an unfortunate discussion about whether NDEs are "real" or "unreal". There  
87 is no need to doubt that people's experiences are real in so far as almost all these people experience what  
88 they experience: Malingering is an extremely rare phenomenon. The key question is, what are the cerebral  
89 mechanisms behind these experiences? Like many people interested in NDEs, the authors fail to recognize  
90 that NDEs are conscious experiences, albeit corresponding to a state of disconnected consciousness,<sup>17</sup>  
91 generated by neurophysiological, cerebral mechanisms.

92 Fifth, there are inconsistencies and controversies in the terminology used in the paper. For example,  
93 expressions such as "a heightened sense of consciousness" or "well-structured thought processes" are  
94 neither scientific nor unambiguous. Another example is the use of the outdated term "persistent vegetative  
95 state" (PVS). The American Academy of Neurology (AAN) and other institutions recommend to avoid this  
96 term,<sup>18</sup> and the abbreviation 'PVS' is confusing as it is the same for "permanent vegetative state".<sup>19</sup>  
97 Moreover, it is incorrect that patients in a vegetative state (a term that, owing to its pejorative connotations,  
98 was renamed '*unresponsive wakefulness syndrome*' more than 10 years ago<sup>20</sup>) "have irreversibly lost  
99 consciousness" (p. 13 from<sup>1</sup>) since most of these patients will recover to at least a minimally conscious state  
100 with prolonged follow-up.<sup>21,22</sup> Finally, the most important flaw is related to the expressions "loss of  
101 consciousness" and "unconsciousness". The authors argue that

102 "a period of [loss of consciousness] is a prerequisite for reported memories that occur during life-  
103 threatening/critical care disorders" (p. 10 from<sup>1</sup>).

104 This paradox reflects the paper's lack of neuroscientific expertise. Rather than concluding that NDEs made  
105 during cardiac arrest are evidence for human consciousness being able to exist outside a functioning brain,  
106 the most parsimonious explanation is that NDEs are made just prior to the loss of consciousness (or

107 immediately after consciousness is regained) —and hence can be remembered with successful resuscitation.  
108 Subjective experiences that can be reported, in whatever the context, are conscious experiences. Perhaps the  
109 authors wanted to refer to an absence of *responsiveness*, i.e., a lack of behavioral interaction with the outside  
110 world, but lack of responsiveness must not be confused with lack of *consciousness*, as evidenced by residual  
111 consciousness during anesthesia,<sup>23,24</sup> rapid and non-rapid eye movement sleep<sup>25,26</sup> or brain injury with  
112 cognitive motor dissociation.<sup>27,28</sup> Analogous to these conditions, NDEs are made during a state of internal  
113 awareness in unresponsive states.<sup>17</sup>

114 Sixth, despite the extensive reference list, the authors fail to cite and discuss several important studies,  
115 including those investigating what happens in the dying human brain using intracranial recordings in people  
116 who were, in fact, dying,<sup>4,29</sup> and work discussing how cortical spreading depolarizations and spreading  
117 ischemia during the dying process might give rise to NDE,<sup>30</sup> and how phylogenetics might offer an  
118 explanation for the evolutionary origin of NDEs.<sup>31</sup>

119 Finally, the authors criticize the grading scales developed for the scientific study of NDEs, but not all their  
120 arguments are compelling. NDEs are challenging to investigate because they rely on first-person narratives,  
121 which like other disconnected conscious states —such as dreaming— are inherently subjective. Martial et al.<sup>14</sup>  
122 recently developed a standardized scale with strong psychometric properties for improved quantification  
123 and characterization of NDEs. Contrary to what Parnia et al.<sup>1</sup> write, this Near-Death Experience Content  
124 (NDE-C) scale does overcome some of the limitations of the NDE scale developed by Greyson<sup>32</sup> like a  
125 failure to account for distressing NDE experiences (see<sup>14</sup> for details). Although Parnia et al.<sup>1</sup> question the  
126 existence of distressing NDEs<sup>33</sup> which they consider “related to [intensive care unit] delirium, delusions,  
127 and dreams in response to toxic metabolic states and withdrawal states (e.g., alcohol withdrawal)” (p. 17 of  
128 File S2 from<sup>1</sup>), the latter claim is not empirically supported.

129 In conclusion, the “guidelines and standards” by Parnia and colleagues do not contribute to the scientific  
130 understanding of NDEs and the dying process. The authors combine in their publication two different  
131 aspects of the phenomenon of death: On the one hand, the cellular mechanisms occurring in the dying brain,  
132 and on the other hand, the subjective experiences that people report when facing life-threatening situations.  
133 These two aspects are best kept separate to avoid confusion between NDE and the concept of brain death.

134 Although (near-)death research certainly merits a framework directive, the paper by Parnia et al.<sup>1</sup> is subject  
135 to a surprising lack of neuroscientific understanding. It reflects the fact that the field of NDE research (at  
136 least in parts) is biased by a widely held belief that there is something fundamentally special, if not  
137 supranatural, about NDEs, such as the notion that humans can have conscious experiences in the absence of  
138 a functioning brain.

### 139 **Competing interest statement**

140 The author declares no competing interests.

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### 142 **Authors contributions**

143 CM and DK have drafted the original manuscript; all authors have revised the manuscript.

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