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Incidence and correlates of near-death experiences in a cardiac care unit

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Abstract

Near-death experiences, unusual experiences during a close brush with death, may precipitate pervasive attitudinal and behavior changes. The incidence and psychological correlates of such experiences, and their association with proximity to death, are unclear. We conducted a 30-month survey to identify near-death experiences in a tertiary care center cardiac inpatient service. In a consecutive sample of 1595 patients admitted to the cardiac inpatient service (mean age 63 years, 61% male), of whom 7% were admitted with cardiac arrest, patients who described near-death experiences were matched with comparison patients on diagnosis, gender, and age. Near-death experiences were reported by 10% of patients with cardiac arrest and 1% of other cardiac patients ($P<.001$). Near-death experiencers were younger than other patients ($P=.001$), were more likely to have lost consciousness ($P<.001$) and to report prior purportedly paranormal experiences ($P=.009$), and had greater approach-oriented death acceptance ($P=.01$). Near-death experiencers and comparison patients did not differ in sociodemographic variables, social support, quality of life, acceptance of their illness, cognitive function, capacity for physical activities, degree of cardiac dysfunction, objective proximity to death, or coronary prognosis.

Keywords: Near-death experience; Cardiac arrest

1. Introduction

Unusual experiences at the approach of death, which have come to be called *near-death experiences* in recent decades, have been reported anecdotally for centuries and described in medical journals since the 19th century [1]. These experiences, which often include subjective impressions of being outside the physical body and of seeing deceased relatives, are of importance to mental health professionals because they may be followed by pervasive changes in attitudes and behavior. Cassem and Hackett [2] a quarter century ago wrote that the incidence of near-death experiences was unknown, but estimated it at about 2% of survivors of cardiac arrest. Since that time, studies using objective measures among unbiased samples of patients coming close to death suggest an incidence of between 9% and 18% [1]. In the past year, a Dutch study of 344 consecutively admitted cardiac patients reported near-death experiences in 12% [3], a British study of 63 survivors of cardiac arrest reported near-death experiences in 11% [4], and an American study of 30 survivors of cardiac arrest reported near-death experiences in 23% [5].

This study investigated the incidence and correlates of near-death experiences among a large cohort of patients who came close to death from heart disease and were admitted to the cardiology service of the University of Virginia Health System. It was hypothesized that the incidence of near-death experience would be higher among patients with cardiac arrest than with those having other cardiac diagnoses.

2. Methods

Prospective subjects were all patients admitted to the cardiac intensive care unit (CCU) or the cardiology step-down unit of the University of Virginia Hospital who were not too ill, psychotic, or cognitively impaired to be interviewed. Patients were approached as soon after admission as their condition had stabilized, by study personnel who explained the project and invited them to participate.

Eligible patients who signed informed consent agreements to participate in the study were given a 15-min screening interview that included questions about sociodemographic variables and the acute cardiac event that led to

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hospitalization, and the NDE Scale [6], a 16-item multiple-choice instrument that significantly differentiates persons who have near-death experiences during a close brush with death from those who do not [7]. The scale includes questions about cognitive processes (e.g., sense of time speeding or slowing), affective processes (e.g., feelings of peace or pleasantness), purportedly paranormal experiences (e.g., sense of separation from the physical body), and experienced transcendence (e.g., sense of being in an unearthly realm or dimension of existence).

Those patients who scored 7 or more points on the NDE Scale were assigned to the *experiencer group*. The remaining patients were assigned to the *nonexperiencer group.* Following the identification of each member of the experiencer group, the next nonexperiencer group patient who matched that experiencer in age (within 5 years), gender, and primary diagnosis was assigned to the *matched control group.*

All members of the experiencer group and the matched control group were given a second, extended interview to assess their cognitive function, quality of life, attitudes toward life and death, and prior unusual experiences. This extended interview took between 30 and 60 min, and included the following measures:

1. Cognitive function was assessed with the Mini-Mental State Exam [8], a standard instrument for quantitative assessment.
2. Quality of life prior to the acute cardiac event was assessed with: a) the Duke Activity Status Index [9], a 12-item scale of capacity for physical activities that is highly correlated with peak oxygen uptake; b) the Network Support Scales [10], brief measures of instrumental support, problem-oriented emotional support, and nonproblem-oriented emotional support, developed to assess susceptibility to coronary artery disease; and, c) the Perceived Quality of Life Scale [11], an 11-item measure of need satisfaction developed among intensive care patients.
3. Attitudes toward their illness and toward death were assessed with; a) the Acceptance of Illness Scale, a 15-item Likert scale developed for this study based on prior analysis of narrative descriptions of acceptance of cardiac disease [12]; and, b) the Death Attitudes Profile [13] a 21-item Likert scale that measures Fear of Death and Dying; Approach-Oriented Death Acceptance, reflecting views of death as a passage to a pleasant state; Escape-Oriented Death Acceptance, reflecting views of death as escape from painful existence; and Neutral Death Acceptance, reflecting views of death as a reality neither welcomed nor feared.
4. Prior unusual experiences that may predispose patients to near-death experiences were assessed with a 19-item short form of the Survey of Psi Experiences [14], which addresses "psychic" experiences such as purported extrasensory perception, purported paranormal experiences such as déjà vu, altered states of consciousness such as dreams, and related activities such as meditation.

Further information obtained from patients' medical records was used to determine; a) the severity of myocardial dysfunction on a standardized 4-point scale [15] of "cardiogenic shock," "severe heart failure," "heart failure," and "no heart failure"; b) the Coronary Prognostic Index [16], a weighted index based on sex, age, past history, cardiogenic shock, heart failure, electrocardiogram, and cardiac rhythm; and, c) proximity to death on a 4-point scale of "loss of vital signs," "progression to loss of vital signs likely without medical intervention," "condition serious but not near death," and "condition not serious." These evaluations of the medical records were performed independently by two physicians or a physician and a nurse, both of whom were blind to patients' group assignment. In the event of disagreement on these ratings, the two raters were required to discuss the case until they reached consensus.

Characteristics assessed as continuous variables are presented as means ± SD, and were analyzed with two-sided *t* tests. Characteristics assessed as categorical variables are presented as number of patients (% of group), and were analyzed with χ^2 tests. Data derived from the screening interview were used to compare the near-death experiencers with the matched control group, and to compare the experiencers with the entire nonexperiencer group. Data derived from the extended interview and from the medical records were used to compare the near-death experiencers with the matched control group only. All analyses were performed with SPSS software, version 10.1 (SPSS Inc., Chicago, IL).

This study was approved by the Human Investigation Committee of the University of Virginia Health System.

3. Results

The mean age of the 1595 patients interviewed was 63 years ± 13; 970 patients (61%) were male. A total of 459 patients (29%) were employed, and 353 (22%) lived alone.

Of the 1595 patients, 675 (42%) were admitted to the cardiac intensive care unit (CCU); the rest were admitted directly to a step-down cardiac unit. Screening interviews were conducted in the CCU for 246 patients (15%) and on the step-down unit for the remaining patients. Screening interviews were conducted 3.8 ± 3.9 days after admission; 90% of them were conducted within 6 days of admission.

One hundred and sixteen patients (7%) were admitted with a primary diagnosis of cardiac arrest, including ventricular fibrillation, asystole, and sustained ventricular tachycardia; 490 (31%) with myocardial infarction; 624 (39%) with unstable angina; and 365 (23%) with other cardiac diagnoses, including arrythmias, congestive heart failure, syncope, heart block, pacemaker malfunction, cardiomyopathy, coronary artery disease, and valvular disease.

Loss of consciousness was reported by 302 patients (19%), diminution of consciousness by an additional 423 patients (27%), and normal consciousness by 870 patients (55%). 37 patients (2%) described themselves as having died, 245 (15%) as having been "close to death," 428 (27%) as "not close to death," and 885 (56%) could not say how close they had come to death.

Of the 1595 patients interviewed, 27 scored 7 or more points on the NDE Scale; those were assigned to the experiencer group. The remaining 1568 patients were assigned to the nonexperiencer group. Control patients matched to members of the experiencer group on age, gender, and primary diagnosis were identified for only 23 of the 27 near-death experiencers. No patients were found in the nonexperiencer group who met matching criteria for the remaining 4 near-death experiencers.

In addition to the 27 patients (2%) who scored 7 or more points on the NDE Scale in their description of an experience occurring during the current cardiac episode, 81 additional patients (5%) described near-death experiences that had occurred prior to the current episode; those patients were not included in the experiencer group for the present study. Every patient who reported a near-death experience scored 7 or higher on the NDE Scale, whereas no patient who denied having a near-death experience did so.

Near-death experiencers, comprising 2% of the entire sample, included 10% of patients admitted with cardiac arrest, 1% of those with myocardial infarction, 1% of those with unstable angina, and 1% of those with other cardiac diagnoses.

Baseline characteristics of the sample are presented in Table 1. The near-death experiencers were significantly younger than the nonexperiencer group, but no significant differences were observed in demographic variables of gender, percent employed at the time of admission, or percent living alone.

Near-death experiencers did not differ significantly from nonexperiencers matched on age, gender, and diagnosis on premorbid health status, as assessed by the Duke Activity Status Index measuring capacity for physical activity, the Perceived Quality of Life Scale measuring self-reported life satisfaction, and the Network Support Scales measuring interpersonal support networks.

The percent of near-death experiences admitted to the CCU was significantly higher than the percent of all nonexperiencers, indicating greater severity of illness; but it was not higher than the percent of nonexperiencers matched on age, gender, and diagnosis. The distribution of diagnoses differed significantly between the near-death experiencers and nonexperiencers, with cardiac arrest being over-represented among the experiencers.

Self-reported descriptions of state of consciousness during the cardiac event differed significantly between the near-death experiencers and nonexperiencers, including those in the matched control group, with near-death experiencers more frequently describing loss of consciousness. Self-reported closeness to death also differed significantly between the near-death experiencers and the nonexperiencers, including those in the matched control group, with near-death experiencers more frequently reporting that they had died or been close to death. Based on review of their medical records, the near-death experiencers and matched nonexperiencers did not differ statistically on the 4-point scale of objective proximity to death, the classification of cardiac dysfunction, or the Coronary Prognostic Index.

The screening interview was conducted for near-death experiencers significantly later after admission than for nonexperiencers, indicating more time required for clinical stabilization, but not later than the screening interviews for nonexperiencers in the matched control group. Near-death experiencers did not differ significantly from nonexperiencers matched on age, gender, and diagnosis on the Mini-Mental State Exam, measuring cognitive function.

As dictated by the criteria for assignment to study group, scores on the NDE Scale were significantly higher among near-death experiencers than among nonexperiencers; the difference was greater than two orders of magnitude. Table 2 presents the frequency of individual elements of near-death experiences among the experiencers, the matched control group, and the entire nonexperiencer group. Differences between the near-death experiencers and each of the latter groups were significant for each individual element at $P<.001$. Among the 27 near-death experiencers in this study, NDE Scale scores ranged from 7 to 23, with a mean of 12.7 and a median of 12. Among the 23 matched nonexperiencers, 21 scored no points on the NDE Scale and the remaining 2 scored only 1 point. Among the 1568 nonexperiencers in this study, 1503 (96%) scored no points on the NDE Scale, and all scored 5 points or fewer.

Attitudes and purportedly paranormal experiences of the near-death experiencers and matched control patients are presented in Table 3. Near-death experiencers did not differ significantly from nonexperiencers matched on age, gender, and diagnosis on the Acceptance of Illness Scale.

On the Death Attitudes Profile, near-death experiencers scored significantly higher than matched nonexperiencers on Approach-Oriented Death Acceptance, reflecting views of death as a passage to a pleasant state; but the two groups did not differ significantly on Fear of Death and Dying, Escape-Oriented Death Acceptance, or Neutral Death Acceptance.

On the Survey of Psi Experiences, experiencers reported significantly more previous purported paranormal experiences than did the matched nonexperiencers, and marginally more altered states of consciousness; but the two groups did not differ significantly on purported psychic experiences or related activities.

4. Discussion

The findings of this study, the largest survey of near-death experiences among cardiac patients, confirm and ex-

Table 1
Baseline characteristics of the sample*

Characteristic	Matched			All	
	NDErs** (N = 27)	Non-NDErs (N = 23)	P Value†	Non-NDErs (N = 1568)	P Value†
Demographics:					
Age–yr	56 ± 13	59 ± 12	0.36	64 ± 13	0.001
Male sex–no. (%)	17 (63)	15 (65)	0.96	953 (61)	0.82
Employed–no. (%)	10 (37)	8 (35)	0.88	448 (29)	0.29
Living alone–no. (%)	2 (7)	6 (26)	0.07	351 (22)	0.07
Premorbid health status:					
Duke Activity Status Index	30.8 ± 19.1	34.9 ± 19.6	0.55		
Perceived Quality of Life Scale	75.6 ± 15.9	77.0 ± 16.0	0.80		
Network Support Scales:					
Instrumental network support	2.8 ± 1.7	2.1 ± 1.2	0.14		
Emotional support	3.2 ± 1.7	2.5 ± 1.4	0.21		
Non-problem oriented support	8.7 ± 2.3	8.5 ± 2.6	0.83		
Clinical variables:					
Admitted to CCU–no. (%)	20 (74)	15 (65)	0.48	655 (42)	0.001
Diagnosis–no. (%)			0.81		<0.001
Cardiac arrest	11 (41)	7 (30)		105 (7)	
Myocardial infarction	7 (26)	7 (30)		478 (31)	
Unstable angina	6 (22)	6 (26)		611 (39)	
Other cardiac diagnosis	3 (11)	3 (13)		374 (24)	
Self-reported consciousness–no. (%)			0.04		<0.001
Loss of consciousness	17 (63)	7 (30)		286 (18)	
Diminished consciousness	7 (26)	6 (26)		416 (27)	
Normal consciousness	3 (11)	10 (43)		866 (55)	
Self-reported closeness to death–no. (%)			0.02		<0.001
Considered dead	7 (26)	1 (4)		30 (2)	
Close to death	14 (52)	8 (35)		232 (15)	
Not close to death	3 (11)	2 (9)		425 (27)	
Cannot say	3 (11)	12 (52)		881 (56)	
Objective proximity to death–no. (%)			0.61		
Vital signs lost	7 (26)	7 (30)			
Progression to loss of vital signs likely	9 (33)	8 (35)			
Condition serious but not near death	9 (33)	8 (35)			
Condition not serious	2 (7)	0 (0)			
Classification of cardiac function–no. (%)			0.33		
Cardiogenic shock	2 (7)	0 (0)			
Severe heart failure	7 (26)	3 (13)			
Heart failure	7 (26)	7 (30)			
No evidence of heart failure	11 (41)	13 (57)			
Coronary Prognostic Index	11.6 ± 5.6	9.3 ± 3.8	0.21		
Hospital day of interview	7.4 ± 10.7	4.5 ± 2.4	0.22	3.7 ± 3.6	<0.001
Mini-Mental State Exam	26.7 ± 2.5	27.3 ± 2.7	0.46		
NDE Scale	12.7 ± 5.5	0.1 ± 0.3	<0.001	0.1 ± 0.5	<0.001

* Plus-minus values are means ± SD. Because of rounding, not all percentages total 100; ** NDErs = near-death experiencers; † P values are for the comparison between NDErs and either matched non-NDErs or all non-NDErs.

tend findings of the three comparable but smaller studies published within the past year. A Dutch study [3] reported that 12% of cardiac patients described near-death experiences, and found no influence of unconsciousness, duration of arrest, or medication, although experiences were significantly associated with younger age. The latter finding was replicated in the present study. A British study [4] reported that 11% of cardiac arrest survivors described near-death experiences, and found no influence of medications, electrolytes, or arterial blood gases, with the exception that the experiencers had higher partial pressure of oxygen than did control patients. A smaller American study [5] reported that 23% of cardiac arrest survivors described near-death experiences. An older study of patients undergoing cardiac electrophysiology studies [17] reported that 14% of 42 patients who experienced hemodynamic instability related to ventricular or supraventricular arrhythmias described near-death experiences. This

Table 2
Frequency of near-death experience elements reported on NDE scale

Element	Matched		All
	NDErs** (N = 27)	Non-NDErs (N = 23)	Non-NDErs (N = 1568)
Cognitive Elements–no. (%)			
Altered sense of time	18 (67)	1 (4)	39 (2)
Accelerated thought processes	12 (44)	1 (4)	20 (1)
Life review	8 (30)	0 (0)	5 (<1)
Sense of sudden understanding	8 (30)	0 (0)	2 (<1)
Affective Elements–no. (%)			
Feeling of peace	23 (85)	0 (0)	7 (<1)
Seeing/feeling surrounded by light	19 (70)	0 (0)	3 (<1)
Feeling of joy	18 (67)	0 (0)	1 (<1)
Feeling of cosmic unity/oneness	14 (52)	0 (0)	2 (<1)
Purportedly Paranormal Elements–no. (%)			
Sense of being out of the physical body	19 (70)	0 (0)	14 (1)
Preternaturally vivid sensations	4 (15)	0 (0)	2 (<1)
Purported extrasensory perception	3 (11)	0 (0)	0 (0)
Purported precognitive visions	2 (7)	0 (0)	0 (0)
Apparent Transcendental Elements–no. (%)			
Sense of an "otherworldly" environment	17 (63)	0 (0)	2 (<1)
Sense of deceased/religious spirits	14 (52)	0 (0)	6 (<1)
Sense of a border/"point of no return"	11 (41)	0 (0)	2 (<1)
Sense of a mystical entity	7 (26)	0 (0)	1 (<1)

** NDErs = near-death experiencers.

study's finding of near-death experiences among 10% of survivors of cardiac arrest is consistent with these previous reports.

A new finding in this study was the differential incidence of near-death experiences among patients with varying cardiac diagnoses. As hypothesized, those patients admitted with cardiac arrest reported significantly more near-death experiences than did patients admitted with other cardiac diagnoses. Near-death experiences were ten times more likely to be reported by survivors of cardiac arrest than by patients with any other cardiac diagnosis. Prior researchers have noted that near-death experiences occurring in the absence of documented cardiac arrest – so-called "fear-death experiences" – tend to include fewer sensations of bright light, enhanced cognitive function, and positive emotions than do experiences during documented cardiac arrest [18]. This study is the first report documenting the decreased frequency of near-death experiences in patients without documented cardiac arrest, a finding that supports the association between these experiences and proximity to death.

Given that association, it is reasonable to ask why the frequency of near-death experiences among patients resuscitated from cardiac arrest is as low as 10%. That percent-

Table 3
Attitudes and experiences of near-death experiencers and matched control patients*

Characteristic	Matched		
	NDErs** (N = 27)	Non-NDErs (N = 23)	P Value†
Acceptance of Illness Scale	25.1 ± 6.2	26.9 ± 3.9	0.22
Death Attitudes Profile:			
Fear of death/dying	19.2 ± 6.5	16.5 ± 6.6	0.25
Approach-oriented death acceptance	18.3 ± 2.1	15.7 ± 3.3	0.01
Escape-oriented death acceptance	14.9 ± 3.6	13.5 ± 3.3	0.25
Neutral death acceptance	17.6 ± 3.2	16.6 ± 2.6	0.35
Survey of Psi Experiences:			
Purportedly psychic experiences	1.2 ± 0.9	1.5 ± 1.1	0.39
Purportedly paranormal experiences	2.2 ± 1.7	0.9 ± 1.0	0.009
Altered states of consciousness	2.0 ± 1.3	1.1 ± 1.1	0.05
Psi-related activities	0.8 ± 1.18	0.7 ± 0.7	0.90

* Plus-minus values are means ± SD. Because of rounding, not all percentages total 100; ** NDErs = near-death experiencers; † P values are for the comparison between NDErs and matched non-NDErs.

age, of course, reflects not the proportion of cardiac arrest survivors who actually *have* near-death experiences, but rather the proportion who are able to recall such experiences and are willing to relate them to investigators. The amnesia that often accompanies cardiac arrest may well make it difficult or impossible for many experiencers to recall at a later time their subjective experiences during the arrest [19]. That hypothesis may explain the finding in this study and in the Dutch study that recall of near-death experiences was associated with younger age, as older survivors of cardiac arrest are more likely to suffer greater cerebral ischemia [3]. Another factor that may reduce the frequency of near-death experience reports is that those patients who do remember such experiences are often unwilling to disclose them to health professionals or researchers for fear of being ridiculed or being diagnosed as mentally ill [20].

This study confirmed the utility of the NDE Scale in identifying patients who describe near-death experiences: there was a hundredfold difference between the mean scores of the near-death experiencers and the nonexperiencers, and each individual item on the scale statistically differentiated the experiencers both from the matched controls and from the entire sample of nonexperiencers. Five features of near-death experiences were reported by more than two-thirds of the experiencers: an altered sense of time, a sense of being out of the physical body, seeing or feeling surrounded by light, and feelings of peace and of joy. Among those five features, only time distortion was reported by *any* of the matched control patients, and that was reported by only 4%; while none of these five features was reported by more than 2% of the entire sample of nonexperiencers.

Neurochemical models proposed to explain near-death experiences have implicated endorphins, putative unidentified ketaminelike endogenous hallucinogens, NMDA receptors, serotonin pathways, limbic system activation, temporal lobe anoxic seizures, and cerebral hypoxia or hypercarbia [21–22]. However, empirical evidence for a neural substrate of near-death experiences has remained elusive; and those models that have been studied empirically, such as the influence of blood gases, have been disconfirmed [4]. In the absence of an accepted animal correlate of mystical experience, neuroanatomic data have been largely limited to anecdotal studies [23–24], although brain imaging studies of meditators have implicated increased frontal and decreased parietal lobe activity in experiences of cosmic unity and transcendence [25]. Although the underlying neurologic basis of near-death experiences remains conjectural at this point, available anecdotal evidence suggests involvement of endorphin-induced limbic lobe activity and/or NMDA receptor blockade by putative endogenous neuroprotective molecules [23].

In this study, near-death experiencers were more likely than nonexperiencers to have suffered cardiac arrest, reported more loss of consciousness, and took longer to stabilize before they could be interviewed. However, nonexperiencers matched on age, gender, and diagnosis did not differ from the experiencers on any objective physiological variable measured in this study. This finding is perhaps not surprising, inasmuch as physiological changes were likely to have occurred only briefly, and with variability amongst individual patients. Nevertheless, these findings did not provide any support for physiological models of the etiology of near-death experiences.

Psychological models proposed to explain near-death experiences have implicated dissociation or depersonalization as a defense against the threat of death, absorption and wish-fulfilling hallucinations, state-dependent reactivation of birth memories, regression in the service of the ego, and reconstruction of distorted or partial memories after a period of unconsciousness [22,26]. Although there has been some evidence of dissociative tendencies in experiencers [27], psychological models of near-death experiences have not been tested rigorously.

In this study, near-death experiencers reported greater approach-oriented death acceptance than did nonexperiencers. That finding of more positive views toward death complements prior research documenting reduced fear of death and death anxiety among near-death experiencers [28]. Furthermore, near-death experiencers in this study were more likely than nonexperiencers to believe they had died or been close to death. Both those findings are compatible with a psychological etiology for the experience, if they in fact preceded it. However, both those findings could also plausibly be the results of a pleasurable experience during a close brush with death. It cannot be determined from these data, collected after the brush with death, whether they were a cause or an effect of the near-death experience.

Most near-death experiencers themselves endorse a religious or spiritual model for understanding their experiences, interpreting them as actual separations from their physical bodies and glimpses of the afterlife [22]. Near-death experiences often exhibit the cardinal phenomenological features of mystical states and lead to characteristic spiritual growth that typically follows mystical experiences [29]. Whether or not near-death experiences can provide any evidence of life after death is a controversial question, but one that is not impervious to empirical exploration [30].

We included in this study questions about prior purportedly paranormal experiences, because of previous reports of such events among near-death experiencers [31]. Experiencers in this study did in fact report more prior purportedly paranormal experiences than did nonexperiencers. That difference may suggest that persons who believe they have had paranormal experiences in the past are more likely to report near-death experiences; or it may suggest that persons who have near-death experiences are more likely retroactively to interpret past experiences as paranormal. Again, these data, collected after the experience, cannot distinguish between cause and effect. It is notable that experiencers and matched controls did not differ on reports of prior "psychic" experiences or related activities. That is, although experiencers are more likely to interpret past experiences as paranormal,

they are not more likely to have sought or experienced behaviors related to paranormal claims.

For four of the 27 near-death experiencers in this study, no patient subsequently admitted within the 3-year span of the study matched the experiencers' age, gender, and diagnosis. Those four unmatched experiencers were a 23-year-old man with ventricular fibrillation, a 49-year-old man with ventricular fibrillation, a 43-year-old woman with a ventricular tachycardia arrest, and a 64-year-old woman with ventricular fibrillation. These four unmatched experiencers tended to be younger than those for whom matched control patients were found. However, the mean ages of the matched (44.8 ± 17.0 yrs) and unmatched experiencers (58.6 ± 12.3 yrs) were not statistically different ($t = 1.98$, $df = 25$). Likewise, the matched and unmatched experiencers did not differ significantly in gender ($\chi^2 = 0.34$, $df = 1$) or in diagnosis ($\chi^2 = 2.85$, $df = 4$). Thus there is no basis to suspect that the failure to find matched control patients for four of the 27 experiencers influenced any of the statistical comparisons in this study.

No *one* physiological or psychological model by itself explains all the common features of near-death experiences. It is plausible that some features of these experiences may be attributable to neurochemical mechanisms, whereas others may be understood better as psychological reactions, and still others may resist explanation pending the development of new models of mental function [22]. The paradoxical occurrence of heightened, lucid awareness and logical thought processes during a period of impaired cerebral perfusion raises particularly perplexing questions for our current understanding of consciousness and its relation to brain function [21,22]. As prior researchers have concluded, a clear sensorium and complex perceptual processes during a period of apparent clinical death challenge the concept that consciousness is localized exclusively in the brain [3,4].

Assessing changes in patients' lives following their near-death experiences was beyond the scope of this cross-sectional study. Retrospective studies have suggested a consistent pattern of changes in beliefs, attitudes, and values following near-death experiences [22,32], some of which may affect psychosocial adaptation and adherence to treatment. Case studies have elucidated a variety of interpersonal and intrapsychic problems that may bring experiencers to the clinical attention of therapists, as well as therapeutic strategies with which clinicians can broach and manage these experiences [33]. It would be valuable to corroborate those reported aftereffects and the efficacy of those therapeutic approaches in a prospective, longitudinal study of a cohort of near-death experiencers.

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