Empirical Evaluation of the Validity of Near-Death Experience Claims and Assessment of Neuropsychiatric and Motor Deficits Following Cardiac Surgery in Patients Undergoing Planned Circulatory Arrest – Study Design

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This article was submitted to RAD CASA - Medical Sciences as the original article

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 20 May 2025
Accepted: 29 May 2025
Published: 25 June 2025

Citation:
Filipan A, Pavlović P, Hostić V, Maričić M, Silić A, Josipović J, Darko Gabrić I. Empirical evaluation of the validity of near-death experience claims and assessment of neuropsychiatric and motor deficits following cardiac surgery in patients undergoing planned circulatory arrest – study design

567=70-71 (2025): 44-50
DOI: 10.21857/yrvgqt3w79

Abstract

Introduction: Near-death experiences (NDEs) have been widely reported across cultures, yet their underlying causes remain debated. This study design focuses on prevalence, phenomenology and psychological impact of NDEs in patients undergoing planned circulatory arrest during cardiac surgery. The study also assesses the neuropsychiatric and cognitive consequences of such procedures using a mixed-methods approach.
Materials and Methods: The study uses a convergent parallel mixed-methods design, combining both qualitative and quantitative data collection. Participants will undergo neuropsychiatric and motor tests (MOCA, TNT-A and B) pre- and post-surgery to assess cognitive and motor deficits. In addition, psychometric instruments, including the Greyson NDE Scale, Mysticism Scale, and Purpose in Life Test, will be administered to evaluate the emotional and psychological aspects of experiences. Patients who report NDEs will participate in semi-structured interviews, while medical staff will be surveyed for objective data regarding the surgery. The VR simulation of the NDE experience will be offered to patients who consent, allowing further exploration of cases of out-of-body experiences.
Results: The study design aims to determine the prevalence of NDEs following planned circulatory arrest, the correlation between the duration of circulatory arrest and memory freshness, and the psychological impact of these experiences. It is hypothesized that at least 10% of patients will report NDEs, and some will report out-of-body experiences (OBEs). Additionally, it is expected that patients who score higher on the Greyson NDE Scale will show greater scores on mysticism and purpose in life tests. Data will be analysed using correlation tests, t-tests, and thematic analysis of interview responses.
Conclusions: This study aims to provide new insights into the prevalence and psychological effects of NDEs in cardiac surgery patients, with potential implications for understanding consciousness and the experience of death. By using a combination of standardized psychometric tools and qualitative interviews, this research will contribute to the scientific understanding of NDEs while ensuring participant safety and data integrity.

Keywords: near-death experience, neuropsychiatric deficit, motor deficit, cardiac surgery, planned circulatory arrest

Sažetak

Empirijska evaluacija valjanosti tvrdnji o iskustvima bliske smrti iprocjena neuropsihijatrijskih i motoričkih deficita nakon operacije srca kod pacijenata koji se podvrgavaju planiranom cirkulatornom nastoju – dizajn studije

Uvod: Iskustva bliske smrti (NDE) su često spominjana u različitim kulturama, no njihovi temeljni uzroci i dalje su predmet rasprave. Ovaj studijski dizajn usmjeren je na prevalenciju, fenomenologiju i psihološki utjecaj NDE kod pacijenata koji su podvrgnuti planiranom zastoju cirkulacije tijekom operacije srca. Studija također procjenjuje neuropsihijatrijske i kognitivne posljedice takvih postupaka korištenjem pristupa mješovitih metoda.

Materijali i metode: Studija koristi konvergentni paralelni dizajn mješovitih metoda, kombinirajući kvalitativno i kvantitativno prikupljanje podataka. Sudionici će prije i poslije operacije proći neuropsihijatrijske i motoričke testove (MOCA, TNT-A i B) kako bi se procijenili kognitivni i motorički deficiti. Osim toga, bit će primijenjeni psihometrijski instrumenti, uključujući Greysonovu NDE skalu, Skalu misticizma i Test svrhe života, kako bi se procijenili emocionalni i psihološki aspekti iskustava. Pacijenti koji prijave NDE sudjelovat će u polustrukturiranim intervjuima, dok će medicinsko osoblje biti anketirano radi dobivanja objektivnih podataka o operaciji. VR simulacija NDE iskustva bit će ponuđena pacijentima koji pristanu, što će omogućiti daljnje istraživanje slučajeva izvantjelesnih iskustava.

Rezultati: Cilj studije je utvrditi prevalenciju bliskosmrtnih iskustava (NDE) nakon planiranog zastoja krvotoka, korelaciju između trajanja zastoja krvotoka i svježine pamćenja te psihološki utjecaj tih iskustava. Pretpostavlja se da će najmanje 10% pacijenata prijaviti NDE, a neki će prijaviti izvantjelesna iskustva (OBE). Osim toga, očekuje se da će pacijenti koji postižu više rezultate na Greysonovoj NDE ljestvici pokazati veće rezultate na testovima misticizma i svrhe u životu. Podaci će se analizirati pomoću testova korelacije, t-testova i tematske analize odgovora u intervjuima.

Zaključci: Cilj ove studije je pružiti nove uvide u prevalenciju i psihološke učinke NDE kod pacijenata na operaciji srca, s potencijalnim implikacijama za razumijevanje svijesti i iskustva smrti. Korištenjem kombinacije standardiziranih psihometrijskih alata i kvalitativnih intervjua, ovo istraživanje će doprinijeti znanstvenom razumijevanju NDE-a, a istovremeno će osigurati sigurnost sudionika i integritet podataka.

Ključne riječi: iskustvo bliske smrti, neuropsihijatrijski deficit, motorički deficit, operacija srca, planirani cirkulatorni zastoj

1. Introduction

1.1. Statement of compliance

This clinical trial will be conducted in full compliance with the protocol, the International Council for Harmonisation Good Clinical Practice (ICH GCP) guidelines, and all applicable regulatory requirements of the Republic of Croatia and the European Union, including Regulation (EU) No. 536/2014 on clinical trials and the Croatian Medicines Act, as well as the General Data Protection Regulation (GDPR) (1, 2, 3, 4).

All participating institutions are required to obtain approval from a competent Ethics Committee (EC) prior to initiating the trial, including approval of the protocol, informed consent form(s), and any recruitment materials. Any amendments to the protocol or consent documents must also be submitted for EC approval before implementation.

The study design is based on fundamentals of Parnia's 2014 clinical study conducted in the United Kingdom, known for its strict ethical and regulatory standards (5). The design has been carefully adapted to ensure compliance with EU and Croatian regulations while maintaining a high standard of participant safety, rights, and data protection.

The principal investigator confirms that no deviations from or changes to the protocol will be implemented without prior agreement from the relevant regulatory authorities and documented approval from the Ethics Committee, except when necessary to eliminate immediate hazards to trial participants. All study personnel involved in the conduct, oversight, or management of the trial will have completed training in Human Subjects Protection and ICH GCP guidelines (1, 6).

The protocol, informed consent form(s), recruitment materials, and all other participant-facing documents will be submitted to the Ethics Committee for review and approval. Approval of both the protocol and consent form(s) must be obtained prior to enrolling any participant. Any amendments to the protocol or consent materials will require prior Ethics Committee approval. A determination will be made as to whether re-consent is necessary for participants who were previously enrolled under an earlier version of the consent form.

1.2. Protocol summary

This study explores the empirical basis of near-death experiences (NDEs) using a convergent parallel mixed-methods design, combining qualitative and quantitative approaches (7). The study aims to collect and analyse data from adult individuals (18+) in Croatia who self-identify as having experienced an NDE after cardiac surgery with a planned circulatory arrest (8, 9). Participants will first undergo the MoCA test and the Trail Making Test Parts A and B (TMT-A and B) before and after surgery, following informed consent, to assess potential neuropsychiatric and cognitive deficits (18, 19). In addition to post-operative assessments, participants will complete in-person questionnaires with the research team. Those who report a near-death experience (NDE) will subsequently be invited to participate in semi-structured interviews. The quantitative component involves validated psychometric instruments (e.g., Greyson NDE Scale, Mysticism Scale, Purpose in Life Test) (10, 11, 14). Qualitative data will be analysed using thematic analysis (12). Recruitment will be conducted through informing target group patients before cardiac procedure. The study includes informed consent, baseline data collection and individual interviews scheduled at participants' convenience. Follow-up session including virtual reality depiction of NDE will be available only for interested patients upon providing informed consent. That will be done to offer validation and show individuality of their experiences, to support long-term transformational effects (13, 20).

1.3. Introduction

Near-death experiences (NDEs) have been reported across cultures and clinical contexts, yet their origins—whether neurobiological, psychological, or transcendent—remain contested (5). This study addresses gaps in Croatian research on NDEs by empirically analysing their occurrence, phenomenology and psychosocial impact. The rationale is grounded in the need for scientifically rigorous, culturally contextualized data on NDEs to inform interdisciplinary understanding. The study is adapted from a 2014 UK model known for ethical and methodological standards (5). It builds on prior exploratory and phenomenological research while incorporating standardized instruments for psychological profiling (10, 11). Literature suggests links between NDEs and lasting changes in personality, spirituality, and well-being, but Croatian empirical data are lacking (13). This research aims to provide insight into such transformations, enabling a better understanding of NDEs from both scientific and existential perspectives (15).

1.4. Risk/benefit assessment

Risks are minimal and primarily psychological, stemming from potential emotional discomfort during interviews as participants recall potentially traumatic or deeply personal experiences (13). These will be mitigated through interviewer training, the right to withdraw, and resource referrals. There are no physical risks. Benefits include contributing to underexplored scientific knowledge and potentially therapeutic effects of meaning-making through narration. Societal benefit lies in advancing interdisciplinary understanding of consciousness, process of dying and human transformation.

1.5. Objectives and endpoints

Objectives of this study are following:

a) Determine the prevalence of NDEs in patients after planned circulatory arrest using the Greyson Scale.
b) Analyse patients' experiences, including observations of the surroundings, present individuals, and events during the cardiothoracic surgery (out-of-body experience (OBE), transformation experience).
c) Correlate the time spent in planned circulatory arrest and the time of the survey with the freshness of memories to eliminate bias.
d) Quantify the emotional and psychological aspects of experiences using Likert scales.
e) Identify neuropsychiatric and cognitive consequences in patients using the MOCA test and TNT-A and B tests before and after surgery.
f) Compare patients' subjective experiences with objective statements from medical staff and the environment.

2. Materials and Methods

2.1. Study design and rationale

This study proposes a prospective, multicenter, mixed-methods investigation of near-death experiences in adult survivors of planned cardiac arrest. The study uses a convergent parallel mixed-methods design (7). This allows simultaneous collection of qualitative (interview) and quantitative (survey) data for integrated interpretation. The design is non-interventional and exploratory. It is not blinded nor randomized, as the subject matter (personal experiences of NDEs) does not permit such designs. The qualitative arm includes semi-structured interviews (~20–40 minutes) with participants, analysed via thematic analysis (12). The quantitative arm includes standardized psychometric tools. These include the Greyson NDE Scale, Mysticism Scale, Purpose in Life Test. Data will be triangulated to identify overlapping constructs and validate themes. The rationale lies in capturing the depth of individual NDEs while situating them within psychological and physiological constructs. After pre-surgery neuropsychiatric and motor tests and post-surgery assessments, NDE information will be collected only from the first interview, minimizing re-exposure to reduce discomfort and memory distortion (15). The study will be conducted in person. Study design scheme is presented in Figure 1.

2.2. Study population

Inclusion criteria: adults (18+), fluent in Croatian, who report having experienced an NDE (per test answers) and can provide informed consent.

Figure 1. Timetable of gathering research data

Exclusion criteria: individuals with active psychosis or severe cognitive impairment that prevents informed participation, decline of participation, unconscious for longer than one month period and death.

Participants will be recruited through informing pre-procedure. Lifestyle factors in this prospective study are limited, as participants are included shortly after their involvement in the research and provide real-time data, within a window that minimizes susceptibility to suggestibility or memory distortion. Participants are expected to remain hospitalized for a brief period, ranging from one to four weeks. Screen failures may occur if participants do not meet inclusion criteria after initial contact or if their narratives fall outside the NDE construct (5). Emphasis will be placed on voluntary participation and narrative authenticity.

2.3. Study intervention

There is no clinical intervention. The intervention is the act of participating in the study via:

- completing pre- and post-operative tests to assess neurocognitive function: MOCA Test, TNT-A and B;
- completing surveys consisting of validated scales: Greyson NDE Scale, Mysticism Scale, Purpose in Life Test;
- participating in a recorded semi-structured interview and
- optionally providing consent to virtually recreate audio-visual component OBE during NDE.

Participants can choose to engage in neither, some or all components. Interviews will be conducted online/in person and audio-recorded with consent. There is no medication or physical procedure involved. Adherence is ensured via digital reminders and participant choice of timing. Participants may withdraw at any time without consequences. Discontinuation involves deletion of unprocessed data upon request. For patients whose experiences align with NDEs (especially with OBE elements), medical staff will be surveyed for information about the surgery, patient behaviour and comparisons with reported experiences. Physiological parameters such as ECG, acid-base balance, arterial oxygen levels, and drugs administered during planned circulatory arrest will also be considered. The structured interview will focus on NDEs and OBEs, including descriptions of audiovisual perceptions. In the operating room, predefined visual and auditory stimuli will be placed in areas visible only from the ceiling, similar to Parnia's 2014 study (5). These are expected to be reported by patients. Test probes will also be placed in locations visible from the patient's position to distinguish observations from lucid states before and after surgery.

3. Results

3.1. Assessments and safety

Safety risks are limited to potential emotional discomfort. Interviewers will be trained in trauma-informed interviewing (16). Participants will be advised of their rights and provided with mental health resources (17). All adverse events (e.g., emotional distress) will be noted and, if severe, referred to appropriate care. Data will be pseudonymized to ensure confidentiality. Interview and survey responses will be stored securely and monitored for data completeness. Unanticipated problems will be addressed case-by-case, in consultation with the Ethics Committee if required.

3.2. Statistical plan

3.2.1.Hypotheses

- Patients undergoing cardiothoracic surgery will exhibit neuropsychiatric and motor deficits post-surgery compared to their pre-operative condition.
- More than 10% of patients who undergo cardiothoracic surgery will report near-death experiences (NDEs).
- More than 2% of patients will report out-of-body experiences (OBEs) related to the period of clinical death or reduced consciousness.
- Participants with higher Greyson Scale scores will show greater scores on mysticism and purpose in life measures.

3.2.2. Study power analysis

To ensure high statistical reliability, the study will be powered at 90% with a significance level of $\alpha = 0.01$. Based on this, a minimum of approximately 238 patients is required to estimate a 10% prevalence with high confidence, and over 1,100 patients are needed to detect medium-sized group differences with sufficient power, assuming that 10% of the total sample will report NDEs. To reach these numbers, the study will be conducted across multiple hospitals, enabling broader recruitment and inclusion of a diverse patient population. The qualitative component will include in-depth, semi-structured interviews with approximately 6 to 15 patients who report NDEs, which is considered sufficient to achieve thematic saturation and provide a nuanced understanding of their subjective experiences. This complementary design will allow for both statistically grounded findings and rich, experiential insights into consciousness following planned cardiac arrest.

3.2.3.Sample size calculation

- Qualitative: ~238-1100 participants until thematic saturation.
- Quantitative: ~6-15 participants, enabling correlational analyses with adequate power.

3.2.4.Populations for analysis

All adult participants who undergo the procedure of heart operation with planned circulatory arrest will be included in quantitative analysis. For qualitative analysis, interview transcripts will be analysed for thematic saturation.

3.2.5.Statistical Methods

Correlations (Pearson/Spearman), t-tests, ANOVA and multiple regression may be used to test hypotheses. NVivo or similar

software will be used for qualitative coding. Integration will occur via triangulation matrix to link quantitative profiles with qualitative themes.

4. Discussion

4.1. Why planned circulatory arrest

The planned circulatory arrest closely resembles the resuscitation process and is ideal for studying NDEs because it occurs unexpectedly and without external influences such as medications. In contrast, the planned arrest does involve the administration of various drugs, and therefore, we can expect the data to differ somewhat from those obtained in cases of spontaneous cardiac arrest. It is expected that with a sufficient number of study participants, more than 10% of them will report having had a NDE. However, their experiences may qualitatively differ from those in a classical setting (since drugs are often associated with negative NDE experiences), or participants may not remember them implicitly due to the influence of medications. This is the focus of the study.

4.2. Regulatory, ethical, and study oversight considerations

Informed consent will be obtained before participation. Ethical approval will be sought from a competent EC prior to study start. Participants will be informed of their rights, including the right to withdraw and data protection per GDPR. All data will be anonymized or pseudonymized. The principal investigator will oversee compliance, and all study staff will be trained in ethics and data protection. There is no external monitoring, but internal oversight will ensure adherence to protocol and ethical conduct. Any protocol amendments will be submitted for EC approval prior to implementation.

4.3. Quality assurance and data management

Data will be stored on secure platforms. Interview data will be recorded, transcribed, and coded in anonymized form. Surveys will be stored in encrypted format. Only authorized personnel will access data. Protocol deviations (e.g., incomplete surveys, withdrawn consent) will be documented. Regular checks for data integrity and quality will be conducted by the PI.

4.4. Publication and other policies

Findings will be submitted to peer-reviewed journals and shared at academic conferences. Anonymized datasets may be shared upon request for secondary analysis, with EC approval. Any conflicts of interest will be disclosed. Authorship will follow ICMJE criteria.

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