

Childhood Near-Death Experiences

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• We nonselectively interviewed 11 patients aged 3 through 16 years who had survived critical illnesses, including cardiac arrests and profound comas. Any memory of a time they were unconscious was considered to be a near-death experience (NDE) and was recorded. Seven of these children had memories that included (1) being out of the physical body (six patients), (2) entering darkness (five patients), (3) being in a tunnel (four patients), and (4) deciding to return to the body (three patients). We also interviewed 29 age-matched survivors of illnesses that required intubation, narcotics, benzodiazepines, and admission to an intensive care unit. None of them had any memories of the time they were unconscious. In our study population, NDEs were clearly associated with surviving a critical illness. The elements of NDEs reported are similar to those previously described in adults. No children described elements of depersonalization as part of their NDEs. A core NDE, triggered by the process of dying or resuscitation efforts, may be a natural developmental experience. We present a neurophysiologic hypothesis as to the cause of NDEs.

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A unique psychological experience has been described in adults and children who have survived a life-threatening illness or danger. These near-death experiences (NDEs) have included the following features: (1) the sensation of seeing one's own body from a vantage point outside the physical body; (2) panoramic life review; (3) entering a tunnel; (4) meeting others, including living or dead relatives; (5) encountering a being of light; (6) a sense

of the presence of a deity; and (7) a return to the body.¹⁻⁴ Elements of depersonalization, including an altered sense of time and a detachment from reality, have also been associated with life-threatening traumas.⁵

Near-death experiences have been primarily reported by patients who have survived life-threatening trauma, cardiac arrests, or severe illnesses. There are also reports of NDEs occurring after severe psychological stresses that do not involve physical injuries; for example, survivors of mountain climbing accidents⁶ and workers trapped in mines for days.⁷

Conspicuously absent from phenomenological studies of NDEs are elements of aggression, paranoid ideation, distortions of body image, distortions of reality, illusions or delusions, somatic or olfactory hallucinations, and disorientation or delirium. It is the absence of these elements as well as a reproducible core cluster of experiences outlined above that serve to distinguish NDEs from drug-induced psychoses and psychotic processes.⁸⁻¹³ Although post-traumatic¹⁴ and postcardiac psychoses¹⁵⁻¹⁷ have been described, a review of published case histories demonstrates that they have little in common with NDEs. Intensive care unit (ICU)-induced psychoses have been reported in both children and adults and do not have the characteristic elements of NDEs.¹⁸⁻²⁰

This report presents our findings of NDEs in pediatric patients who have survived acute illnesses that have significant mortality rates. A control population of patients hospitalized in the ICU and treated with mechanical ventilation and narcotics and subjected to the psychological stresses and sensory deprivation of the ICU was also studied. This experimental design was used to clarify whether NDEs are associated with surviving a critical illness or if they

are secondary to medications or psychological stresses.

METHODS Entrance Criteria

Medical records of 202 patients aged 3 to 16 years at time of admission to the pediatric ICU at Children's Orthopedic Hospital and Medical Center, Seattle, from 1978 through 1984 were reviewed. Criteria for selection included the following: (1) a disease process characterized by unconsciousness; (2) premorbid good health, defined as a patient who was performing a grade-level schoolwork, who was holding a full-time job, or who had been documented as demonstrating normal development on standard screening tests; (3) the occurrence of acute illness or trauma or, in the presence of chronic disease, an acute exacerbation of a problem previously managed on an outpatient basis; and (4) a full neuropsychiatric recovery documented by a return to previous school or job performance or by neuropsychiatric testing.

One hundred twenty-five patients failed to meet the entrance criteria, 30 patients were unavailable for follow-up, and seven patients declined to be interviewed, leaving 40 patients in our study population. The study population was divided into two groups: (1) a critically ill group consisting of survivors of conditions with a mortality rate greater than 10% and (2) an age-matched, seriously ill control group consisting of patients unlikely to have significant mortality given the care in our pediatric ICU. The critically ill group consisted of seven survivors of cardiac arrest and four patients with Glasgow coma scores lower than 5 as a result of a motor vehicle accident (one patient), near drowning (two patients), and hyperosmolar coma (one patient). The seriously ill control group consisted of four patients with epiglottitis, ten survivors of head trauma (Glasgow coma score, 7 or greater), six patients who had had cardiac surgery for congenital defects, five patients who had undergone elective surgery under general anesthesia, one survivor of tricyclic antidepressant overdose, and one patient each with diabetic ketoacidosis, Guillain-Barré syndrome, and idiopathic hypotensive episodes.

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This study was approved by and conducted under the auspices of the Children's Orthopedic Hospital Internal Review Board and Human Subjects Committee. Informed consent was obtained from both patients and their parents before they were interviewed. Consent forms and study information sheets were mailed to potential subjects. Telephone contact was then made to arrange an interview. Patients were not coerced in any way, and no inducement to join the study was offered to subjects.

Interview

All interviews were conducted at least two months after hospital discharge. A formal interview schedule, consisting of open-ended questions about memories of the time the patient was unconscious, statements the patient may have made to others concerning that time, the family's religious background, and knowledge of NDEs, was used to ensure uniformity in collecting data. Younger children were encouraged to draw pictures to help them provide a more fluid and continuous account of their experiences. These are examples of typical questions: (1) What do you remember before you came to the hospital (before surgery)? (2) What do you remember about the time you were unconscious (asleep, in the operating room)? (3) What do you think happens after we die? (4) Describe your family's religious beliefs.

After the parent(s) and child had had complete opportunity to describe their experiences and the interview was almost complete, 19 directed questions requiring *yes* or *no* answers based on a compilation of the NDE scale³ and descriptions of transient depersonalization syndromes⁵ were then administered. After the interview, a narrative transcript was dictated by the interviewer, and a third party blinded for experimental details reviewed the dictations and compiled the data. Any subjective experience of any type that the subject described as occurring during the period of unconsciousness was considered an NDE and was used in this study.

RESULTS

Eleven prospectively identified, critically ill patients were interviewed. Seven of these patients described NDEs. Of 29 prospectively identified, seriously ill control patients, three patients had memories of intraoperative events (a phenomenon previously reported in adults²¹), and one patient who had ingested tricyclic antidepressants had a memory of hearing nurses ask for

charcoal. The latter group did not report any other experiences. The elements of NDE that our study population reported were as follows: (1) out-of-body sensation (six patients), (2) entering darkness (five patients), (3) being in a tunnel (four patients), (4) peaceful or positive affect (three patients), (5) frightening or painful experience (three patients), (6) seeing persons or beings dressed in white (three patients), (7) visions of teachers or school classmates (two patients), (8) visions of a deity or heaven (two patients), (9) visions of dead relatives (one patient), (10) reaching a border (one patient), and (11) making a decisional return to the body (three patients). One patient described the distortion of reality. She looked at her mother and perceived a "pig monster" with a noselike snout. These NDEs are associated with surviving a critical illness ($P < .001$, Student's *t* test).

Significantly absent in both groups of patients were any descriptions of memories consistent with transient depersonalization, including a sense of unreality, a sense of harmony or transcendent unity with the universe, time alterations or distortions, worldly detachment, or panoramic life review.

Of the seven patients who described NDEs, only one had previously heard descriptions of NDEs. Three patients had never told anyone of their experiences prior to the interview, and two others had only discussed small fragments of their experiences with their parents. Two patients had completely forgotten their NDEs, and the history was obtained from their parents.

Out-of-Body Experiences

PATIENT 1.—A 6-year-old boy presented for elective tonsillectomy. He had had one intraoperative cardiac arrest and two postoperative cardiac arrests associated with malignant hyperthermia. He described initially floating above his body and seeing the doctors around his bedside. "I had a tube in my mouth."

PATIENT 2.—An 8-year-old girl presented in a hyperosmolar coma with an initial blood glucose level of 2398 mg/dL (133.1 mmol/L). She remembers being asked to urinate in a cup, and then "I was floating over my

body. I was still in the first room [trauma room]. There were two doctors around me." She drew a picture of the experience that included the doctors wearing green surgical masks.

PATIENT 3.—A 12-year-old girl presented at home with a respiratory arrest secondary to bronchospasm. Medics were called to the home, and she responded to bag and mask ventilation, chest compressions, and epinephrine given subcutaneously. She remembers waking up "and feeling that although my arms and legs were very heavy, I was floating above my body." The entire room was very dark and she could only see her body below her with her parents and the medics at her bedside. She denied being light-headed and said "I wasn't really looking down at my body, it only felt like I was floating above my body." She stated that this was a vague memory that had faded by the time of the interview, one year later.

PATIENT 4.—An 11-year-old boy presented with a cardiac arrest secondary to sick-sinus syndrome in the lobby of Children's Orthopedic Hospital and Medical Center. He stated that he had a vivid memory of that first cardiac arrest.

He remembers being in the hospital lobby and then feeling a sinking feeling "like when you go over a bump in a car and your stomach drops out from under you." He heard a "whooshing" noise in his ears and people talking. He then was floating on the ceiling of the room looking down at his body below him. The room was dim, and his body was illuminated by a soft light. He heard a nurse say "I wish we didn't have to do this" and observed ongoing cardiopulmonary resuscitation. He saw a nurse "put some grease on my body," and then she "handed paddles to the doctor." The paddles were placed on his body and when "the doctor pressed the button, I was suddenly back in my body, looking up at the doctor." He perceived significant pain as the shock went through his body and stated that he had recurrent nightmares of the pain of cardioversion.

Nurses present at the event state that he opened his eyes after cardioversion and said "That was really weird. I was floating above my body

and was suddenly sucked back into myself." He had no memory of making that statement. He was immediately taken to the operating room for emergency pacemaker placement.

The Tunnel

PATIENT 1.—This patient (described above) "was in a tunnel. I don't know where I was going or why. It was lined with all kinds of lights, like airplane lights." He drew a picture of a tunnel lined with monochromatic lights of every color.

PATIENT 5.—A 15-year-old boy with chronic renal failure presented for an exploratory aortotomy. He had an intraoperative cardiac arrest. He told his parents after he regained consciousness that "I have a wonderful secret to tell you. I have been climbing a staircase to heaven." He said that the staircase was dark. He had no memory of the experience when he was interviewed.

PATIENT 6.—A 16-year-old boy with chronic renal failure presented with ventricular fibrillation secondary to a serum potassium level of 8 mEq/L (8 mmol/L). He remembers "traveling in a dark tunnel. I don't know where I was going, but knew I really wanted to get to the end of that tunnel. Forget my body, forget being alive, all I wanted to do was get to the end of the tunnel." Bright lights "all the colors of the rainbow" were flashing all around him.

Affect

In general, the children interviewed did not describe a particular mood or emotion associated with the NDEs. Some parts of the experience were described as being pleasant or frightening. For example:

PATIENT 7.—A 12-year-old girl with chronic renal failure undergoing home dialysis had a brief cardiopulmonary arrest associated with a serum potassium level of 8.4 mEq/L (8.4 mmol/L). She responded to cardiopulmonary resuscitation, including chest compressions. She awoke crying and stated to her mother that she had had a frightening experience. She described being in a regular school classroom and being scolded for doing something wrong.

When interviewed, she had no memory of her experience.

Both patients 5 and 6 described their experiences as being "peaceful." Patient 4 said that his experience was "pleasant" until he experienced the painful shock of cardioversion. He described that as "a pain I will never forget."

Patient 2 described a pleasant experience of hearing her classmates sing a song to her and then a fearful experience of being approached by "doctors dressed in white coats. I was afraid to look at them."

The Decision to Return

Patient 2 described a discrete memory not associated with the rest of her NDE. She stated that "doctors dressed in white" told her to press a red button on a "machine by my bed." She "knew that would be wrong" and instead pressed a green button. She then regained consciousness.

Patient 5 told his parents that he returned to his body because "it wasn't my time to die." His parents felt that he was referring to a younger brother who had already died.

Two children had memories of their classmates and teachers. Additionally, patient 6 described a being "about eight feet tall, with long hair and a white robe" who accompanied him into a tunnel. He said "It wasn't Christ, it may have been an angel though, taking me to Christ."

All of the above descriptions of childhood NDEs were obtained in the open-ended narrative portion of the interview. No new information was obtained using the NDE questionnaire administered at the end of the interviews.

COMMENT

Our findings are consistent with adult studies that report that there is a core NDE.^{2,3,22} The childhood core NDE includes (1) the sensation of being out of the physical body, (2) seeing the physical body from a vantage point above it, (3) a perception of darkness, (4) traveling in a tunnel, and (5) a return to the body. A review of previous descriptions of childhood hallucinations showed that these experiences have not been reported.^{23,24}

The salient feature of pediatric NDEs is their concrete nature. The children's descriptions were concrete fragments of memories as opposed to the detailed narratives described in adult studies. There was an absence of elements of depersonalization, including life review, time alteration, wordly detachment, or transcendent feelings. This finding suggests that NDEs are primary events in critically ill children and that depersonalization is a concurrent or secondary process in adults.

Our hypothesis is that surviving a critical illness or life-threatening stress triggers the forementioned core NDE. This core experience is then integrated with other elements depending on the premorbid experiences of the patient. For example, adults frequently report a "life review," which is a natural developmental finding in adults.²⁵ Deeply religious patients perhaps incorporate familiar religious symbols. Adults typically report meeting dead relatives and friends, while children report meeting teachers and living friends. Religious figures, schoolmates, teachers, and relatives who have died may all represent familiar symbols that the mind incorporates into the experience in an effort to make sense of it. A similar phenomenon has been reported in mescaline-induced hallucinations. In clinical laboratory trials, mescaline induces a core psychic experience that is then additionally embellished depending on the cultural background of the patient.²⁶

The most common element of previously reported adult NDEs as well as those described in our study is the sensation of seeing one's own body from a vantage point outside the physical body.^{1-3,22,27} This finding coupled with similarities between NDEs and case histories of hypercapnia,²⁸ LSD,²⁹ and ketamine hydrochloride-induced hallucinations^{30,31} has led to the development of the following hypothesis: NDEs may be the result of the activation of neuronal connections in the temporal lobe that specifically code for out-of-body experiences, with secondary hallucinations that the mind incorporates into the experiences to make sense of them.

There is clear evidence that within

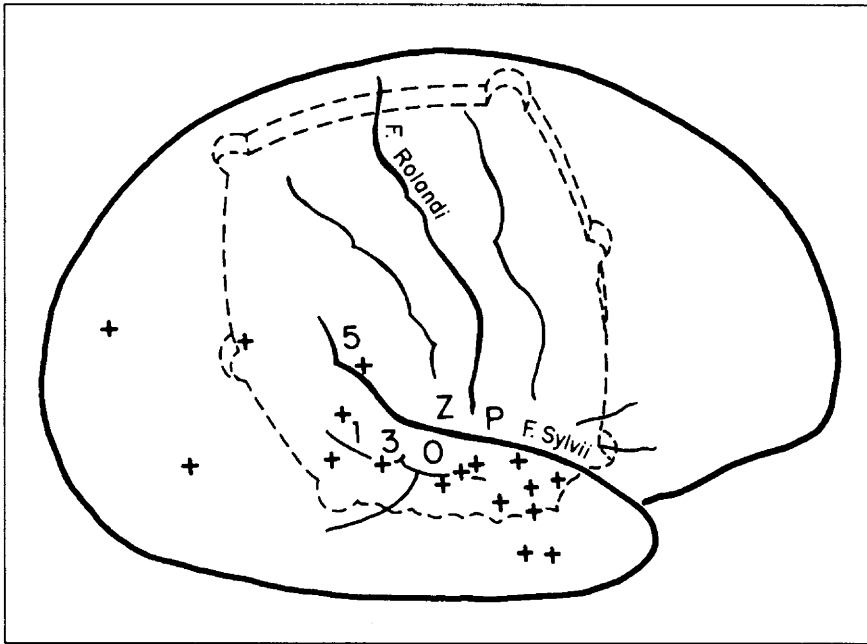


Fig 1.—Temporal lobe. Numbers and letters indicate areas where electrical stimulation produced out-of-body sensation; plus signs, areas where psychic hallucination resulted from stimulation (from Penfield and Rasmussen³³).

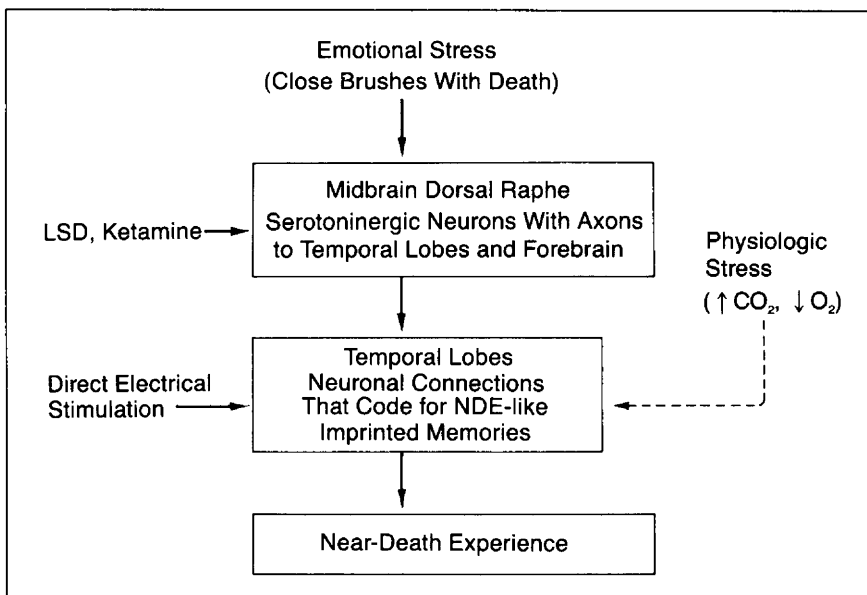


Fig 2.—Factors that produce near-death experiences and common pathways of causation.

the temporal lobe there are neuronal connections that, when electrically stimulated, produce the sensation of being outside the physical body³² (Fig 1). For example, a 33-year-old man suffered from temporal lobe seizures that produced hallucinations of seeing himself.³³ On electrical stimulation within the fissure of Sylvius, the patient exclaimed "Oh, God, I am leav-

ing my body." Penfield³² stated that when complex hallucinations are induced by stimulation of the temporal cortex, they are perceived as memories by the patient. One distinguishing feature of NDEs is that they are perceived as memories by the patient and are not a product of ongoing psychopathology.

This area of the temporal lobe is

connected by serotonergic neurons to the midbrain dorsal raphe. Psychological stress³⁴ and psychoactive drugs such as LSD and ketamine have a neurochemical effect in the latter part of the brain that is mediated by serotonin.³⁶⁻³⁷ We speculate that hypercapnia or hypoxia could also trigger NDE-like experiences through direct activation of the temporal lobe or indirectly through an effect in the mid-brain (Fig 2). We present this model as a first neurophysiologic attempt to analyze NDEs.

Regardless of the psychological or physiologic cause of these unique experiences, it is clear that children who survive life-threatening events report NDEs. It is not known if similar experiences occur in dying patients or if NDEs are phenomena associated solely with resuscitative measures. Further research on the etiology of these experiences as well as the occurrence of NDEs in dying patients is needed. There is some evidence that deathbed visions in adults are associated with a markedly decreased need for analgesia and that heavily sedated adults do not report deathbed visions.³⁸ If NDEs are related to deathbed experiences and are a natural developmental occurrence, this could have profound implications in our treatment of dying patients.

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