



An educational initiative to improve medical student awareness about brain death



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ARTICLE INFO

Keywords:

Brain death
Education
Communication skills
Medical student
Simulation

ABSTRACT

Objective: Medical student knowledge about brain death determination is limited. We describe an educational initiative to improve medical student awareness about brain death and assess the impact of this initiative.

Subjects and methods: Beginning in July 2016, students at our medical school were required to attend a 90-min brain death didactic and simulation session during their neurology clerkship. Students completed a test immediately before and after participating in the initiative.

Results: Of the 145 students who participated in this educational initiative between July 2016 and June 2017, 124 (86%) consented to have their data used for research purposes as part of a medical education registry. Students correctly answered a median of 53% of questions (IQR 47–58%) on the pretest and 86% of questions (IQR 78–89%) on the posttest ($p < .001$). Comfort with both performing a brain death evaluation and talking to a family about brain death improved significantly after this initiative (18% of students were comfortable performing a brain death evaluation before the initiative and 86% were comfortable doing so after the initiative, $p < .001$; 18% were comfortable talking to a family about brain death before the initiative and 76% were comfortable doing so after the initiative, $p < .001$).

Conclusions: Incorporation of simulation in undergraduate medical education is high-yield. At our medical school, knowledge about brain death and comfort performing a brain death exam or talking to a family about brain death was limited prior to development of this initiative, but awareness and comfort dealing with brain death improved significantly after this initiative.

1. Introduction

It is critical for physicians to unflinchingly be able to discriminate between patients who are alive and patients who are dead. Although brain death is the legal equivalent of cardiopulmonary death throughout the USA, the general public does not understand the difference between brain death, a persistent vegetative state, and a coma [1–4]. Physicians should be adept at communicating with families about brain death, but unfortunately, communication skills about end-of-life are often deficient [1]. This can lead to social, ethical and legal problems. Furthermore, it is even more concerning that physician awareness of the criteria and procedures for determining brain death is limited [5].

Because a fundamental understanding of medical topics begins during undergraduate medical education, we decided that it was imperative that medical students be educated about brain death. Although fewer than 5% of medical students go into neurological or

neurosurgical residencies, it is important for all physicians to understand brain death given that 67% of hospitals in the USA do not require a neurologist or neurosurgeon to perform brain death evaluations [6,7].

Students describe case-based team learning in which they are actively involved in the learning process and able to apply their knowledge as satisfying, enjoyable, and effective [8,9]. As a result, we designed an educational initiative for students at our medical school that included both a brain death didactic and simulation session then sought to assess the impact of this initiative.

2. Material and methods

2.1. Educational initiative

All medical students at NYU Medical School are required to participate in an 8-week preclinical neuroscience course at the beginning of

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<https://doi.org/10.1016/j.clineuro.2018.01.036>

Received 2 November 2017; Received in revised form 27 January 2018; Accepted 28 January 2018

Available online 02 February 2018

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their second year and a 4-week neurology rotation between their 18th and 30th month of medical school. In July 2016, a mandatory 90-min brain death didactic and simulation session led by a board-certified neurologist (AL) was scheduled during each neurology clerkship. The first 45 min of the session consisted of a classroom-based lecture which addressed the medical and legal history of brain death; prerequisites for performing a brain death evaluation; instructions for performing a brain death evaluation (which included a 5-min video), apnea test, and confirmatory tests; spinal reflexes and automatisms that can be seen in brain dead patients; and recommendations for communicating with families about brain death. Following the didactic, there was a 45-min simulation using an intubated SimMan 3G® mannequin (Laerdal Medical, Wappingers Falls, NY). A simulation facilitator adjusted the vitals and manipulated the mannequin from the simulation control room. In October 2016, standardized patients were added to the simulation to play the role of the patient's wife. Students were instructed that serial discussions with family members should ideally take place in a quiet conference room, away from the patient's bedside, but that in the simulation environment, these discussions would take place at the bedside both before and after they evaluated the patient. See Appendix 1 in the Supplementary material for the simulation materials, simulation protocol, and background and instructions provided to standardized patients. Although standardized patients were given a script, they were instructed to improvise as needed based on their interaction with the medical students. Aside from the addition of standardized patients, the simulation was not changed at any point during the initiative. Occasional minor updates were made to the didactic portion of the initiative periodically based on student feedback and questions.

2.2. Data collection and analysis

Students were given a test prior to the lecture which assessed both their subjective understanding and comfort with brain death and their knowledge about brain death (see Fig. 1 for the test questions and answers with explanations of the correct responses). For the majority of the test questions, students were asked to review a number of statements and mark all the answers that were true. There were a total of 36 points addressed on the test including ten on findings that can be seen in brain death, nine on the brain death examination, seven on protocols for performing a brain death evaluation, six on the prerequisites for performing a brain death evaluation, and four on laws about brain death in the USA. Following the simulation, the same test was readministered and students were asked to provide feedback on the session. All of the material on the test was addressed in the educational initiative.

This analysis includes pretest and posttest responses for students who were involved in this educational initiative between July 2016 and June 2017 and who consented to participate in the NYU School of Medicine Medical Student Research Registry, an IRB approved registry that allows routinely collected educational data to be compiled in a de-identified longitudinal database and used to answer research questions. Student knowledge and comfort with brain death prior to and following this initiative were compared using Wilcoxon Signed Rank Tests. Chi-square tests or likelihood ratios were used as appropriate to compare student comfort and subjective understanding about brain death for students who participated in sessions without standardized patients (July–September 2016) and students who participated in sessions with standardized patients (October 2016–June 2017). Statistical analysis was performed using SPSS Statistics 21 (AL).

3. Results

3.1. Student data

At our medical school, the student body is 50% female and the mean age for accepted students is 22.7 years. Of the 145 students who

participated in this educational initiative between July 2016 and June 2017, 124 (86%) consented to participate in the Medical Student Research Registry, thereby permitting their routinely collected de-identified educational data to be used for research purposes.

3.2. Knowledge about brain death

Although 107 students (88%) saw the term “brain death” on the internet, only 93 (76%) heard it in a preclinical medical school class and 90 (74%) heard it on their neurology clerkship (Table 1). Before the educational initiative, 40 students (33%) knew that a brain dead patient is comatose, 91 (75%) knew that a brain dead patient does not have brainstem reflexes, and 71 (58%) knew that a brain dead patient is unable to breathe spontaneously. Of the 36 points addressed on the test, students correctly answered a median of 19 (53%, IQR 47–58%) on the pretest and 31 (86%, IQR 78–89%) on the posttest ($p < .001$). Fig. 2 shows the median pretest and posttest scores for each question category. Posttest scores were similar throughout the twelve months of the initiative (median test scores ranged from 82 to 89%).

3.3. Understanding and comfort with brain death

Subjective understanding of brain death and comfort with both performing a brain death evaluation and talking to a family about brain death improved after this initiative (21 students (18%) reported that they would be somewhat or very comfortable performing a brain death evaluation before the initiative and 103 (86%) reported that they would be somewhat or very comfortable doing so after the initiative, $p < .001$; 21 (18%) reported that they would be somewhat or very comfortable talking to a family about brain death before the initiative and 91 (76%) reported that they would be somewhat or very comfortable doing so after the initiative, $p < .001$). After standardized patients were added to the educational initiative, understanding and comfort discussing brain death with a family improved, but not significantly so. However, comfort with performing the brain death evaluation significantly improved after simulation sessions with standardized patients (only one student (4%) in a session without standardized patients reported being very comfortable doing the brain death evaluation whereas 24 students (25%) in sessions with standardized patients reported being very comfortable doing the brain death evaluation ($p = .04$)). See Table 2.

3.4. Feedback on the educational initiative

Of 122 students who completed the posttest, 104 (85%) found the simulation session to be very useful and 114 (93%) reported that they learned a lot from the initiative. Free text comments about the initiative were analyzed for theme. Multiple students reported that the initiative was valuable, fun and interesting. Some students felt that interacting with standardized patients was a bit overwhelming, and a few requested that rather than have a single large group of students participate in the initiative at the same time during each clerkship, simulation sessions be run with only four or five students per group.

4. Discussion

Although multiple studies conducted around the world demonstrate that medical student knowledge about brain death is limited, few offer interventions to enhance education about this important topic [10–18]. Determination of death by cardiopulmonary criteria is, of course, the traditional method of determination of death, whereas determination of death by neurologic criteria was not formally described in the USA by the medical community until 1968. While brain death is legal death throughout the country, some physicians view it as a legal fiction [1,4,19]. Additionally, death by cardiopulmonary criteria occurs more frequently than death by neurologic criteria (the annual number of

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