

Simulation-Based Training in Brain Death Determination Incorporating Family Discussion

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ABSTRACT

Background Good medical care relies on communication as much as technical expertise, yet physicians often overestimate the efficacy of their patient communication skills. Teaching communication skills can be cost- and time-intensive, and efforts have rarely focused on challenging situations, such as conveying the news of a patient's brain death to a family member.

Objective We developed a resource-sensitive simulation program to teach residents how to diagnose brain death and how to show empathy in discussing the diagnosis with the patient's family.

Methods From 2015 to 2017, 3 cohorts of incoming neurology residents participated in the 3-day training exercise. The 2-hour preintervention assessment involved making the diagnosis of brain death and sharing the news with an actor portraying the patient's family member. The scoring via checklists consisted of 15 clinical skills, 9 apnea test-related skills, and 37 verbal skills related to family discussion. The 5-hour didactic intervention focused on technical aspects of the brain death examination and lessons in communication with role-playing. The 2-hour postintervention assessment repeated the brain death examination and family discussion simulations. Data were analyzed using the Wilcoxon signed rank test.

Results A total of 18 residents (100%) were assessed, with significant differences between preintervention and postintervention testing across all areas, including clinical assessment (45%–76%, $P < .001$), apnea testing (57%–92%, $P < .001$), and verbal communication (46%–73%, $P < .001$).

Conclusions The findings suggest a benefit in simulation training for brain death examination, apnea testing, and the subsequent family discussion regarding the patient's diagnosis.

Introduction

The diagnosis of death has grown more nuanced because of advances in life-sustaining therapies. Official guidance has grown more comprehensive as well, beginning with apnea and areflexia in Beecher's 1968 "Harvard Criteria," to brainstem death in the 1981 Uniform Determination of Death Act, to the checklists of the American Academy of Neurology (AAN) practice parameter released in 1995 and updated in 2010.^{1–3} Although brain death is a neurological concept, the ability to make this high-stakes diagnosis accurately and to convey the results to the family is essential in all specialties that function in critical care settings, including emergency medicine, trauma surgery, anesthesiology, pulmonary and critical care, cardiology, and pediatric critical care.

Communication is the bedrock on which the physician-patient-family relationship is built, and ineffective communication may damage this relationship, sometimes beyond repair. Though it is known

that the behavior and language of effective and empathetic communication can be taught, such training is sometimes overlooked in medical education.⁴ We developed and implemented an educational intervention that combined training for making the clinical diagnosis of brain death, and breaking the news to the patient's family in an empathic manner.

Methods

Between 2015 and 2017, 18 neurology residents (6 each year) participated in the intervention toward the end of their intern year at Loyola University Medical Center, a tertiary care facility west of Chicago, Illinois. The program consisted of 3 half-days, and was divided into 4-hour pre- and postintervention assessments with an intervening 5-hour didactic intervention (a maximum of 7 days elapsed between assessments). The didactic intervention consisted of a 1-hour neurology lecture, a 2-hour communication lecture, and 2 hours of communication role-playing. A Laerdal SimMan 3G mannequin (Laerdal Medical, Wappingers Falls, NY) was used for clinical assessment and apnea testing, allowing for simulated respirations, vocalizations, twitching, and reactive pupils. The simulation facilities in the Marcella

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Editor's Note: The online version of this article contains the narrative given to trainee prior to first encounter, and neurological examination, apnea testing, and communication checklists.



FIGURE 1
Observers Controlling the Mannequin and Scoring the Examination Behind a 1-Way Mirror

Niehoff School of Nursing at Loyola University were available to residents, and the standardized patients used for the family discussion were provided by the organ donation network Gift of Hope as a community engagement initiative.

Several documents were prepared prior to the intervention (provided as online supplemental material). A scenario document contained the patient's history of present illness, the consultation question, vital signs, ventilator settings, and arterial blood gas results. The neurological examination checklist, adapted from the American Academy of Neurology's brain death guidelines, listed 15 maneuvers, including warming the patient, assessing pupil reactivity and motor responses to noxious stimulation, and testing of corneal, oculocephalic, oculovestibular, and carinal reflexes.^{2,3} Slips of paper were prepared with arterial blood gas results—1 alkalotic, 1 within normal limits, and 1 acidotic. The apnea test checklist, adapted from the same guidelines, listed 9 maneuvers, including ventilator adjustment and detachment, interpretation of arterial blood gases, reaction to emergent hypotension during apnea testing, and making the diagnosis. The communication skills checklist, adapted from the oncology literature, assesses 4 nonverbal and 21 verbal communication skills, including body language, interview setup, inviting questions, sharing the diagnosis, empathetic response, elicitation of family concerns, and development of a follow-up plan.^{5,6} All assessment tools were developed by the authors without validity testing.

During the preintervention and the post-intervention assessments, each participant's behavior was observed through a 1-way mirror (FIGURE 1). The scenario was provided to the resident prior to entering the examination room, and a computed tomography scan of the head demonstrating diffuse cerebral edema was available for review. Three neurology attending physicians scored the neurological examination checklist and apnea test

What was known and gap

Residents have limited opportunities to develop and test diagnostic and communication skills in rare and challenging situations, such as identifying brain death and disclosing it to family members.

What is new

A simulation program to teach neurology residents how to diagnose brain death and show empathy in discussing it with family.

Limitations

Single site, single specialty study limits generalizability; assessment instruments lack validity evidence.

Bottom line

Simulation training for brain death examination and discussing the diagnosis with family members benefits residents' skills.

checklist, and 1 or 2 palliative care attendings were used for the communication skills checklist. As the resident's behavior or verbalization was observed, the appropriate checkbox was marked. Each assessment required 2 hours of the attending's time, and a 10-minute orientation to the assessment tools. A volunteer nurse was in the room with the examinee and the mannequin to facilitate the simulated care process. Standardized challenges were introduced into the clinical setting during evaluations, including initial hypothermia, respiratory alkalosis, and emergent hypotension. Following the clinical simulation, each examinee was taken to another room to interact with an actor playing the spouse of the deceased. The actor often was a member of the Gift of Hope organ donation network with expertise in family interaction; faculty and senior residents were used for some simulations. A 15-minute orientation was held for the actors to review the desired communication techniques (TABLE), with instructions to capitalize on contradictory information and to raise questions about spontaneous reflex movements, potential reversibility of brain death, and continued heart rhythm on the monitor. After all participants completed the exercise, a 30-minute group debriefing session reinforced the examination and communication themes, with subsequent 5-minute individual feedback sessions.

Within 3 days of the preintervention assessment, residents participated in the 2-part didactic intervention. A 1-hour lecture by a neurology attending explained the American Academy of Neurology guidelines with attention to the prerequisites of brain death testing, proper examination of the brainstem reflexes, and instruction in ventilator management and blood gas interpretation before and during apnea testing. The second part consisted of a 4-hour session

TABLE

Summary of Communication Techniques to Review Prior to High-Stakes Family Discussions^{6,7}

“SPIKES” Mnemonic for Discussing the Patient’s Condition With Family Members	
Setup: prepare the room, arrange the furniture, and sit down	“I would like to talk to you about something important.”
Perception: determine what is known	“Tell me what your understanding of the situation is.”
Invitation: ask if one can discuss this	“Is it okay to discuss this right now?”
Knowledge: give knowledge clearly and unequivocally	“We were asked to evaluate your loved one because of . . .” “Your loved one is dead; specifically, brain dead.”
Emotions: address and empathize	<i>See NURSE section below</i>
Summarize the plan and provide support	“The next step is . . .”
“NURSE” Mnemonic for Addressing Emotions With Family Members	
Name the problem or emotion	“What are you feeling right now?”
Understand the origin of the issue	“Why do you think you are feeling this way?”
Respect, both verbal and nonverbal	“I hear you. You are feeling . . .”
Support	“That is a reasonable and understandable way to feel right now.”
Explore	“Tell me more about this feeling.”
Ask-Tell-Ask	
Ask	“What do you understand about the situation?”
Tell	“It is very serious; your loved one has died.”
Ask	“Do you understand what you just heard?” “Are there any questions about what you heard?”
Phrases to Avoid	Phrases to Use
“There is nothing more we can do.”	“We can do a lot to keep your loved one comfortable.”
“I know what this must be like.”	“What you are feeling is reasonable.”
“Withdrawal of care” or “Stop the machines.”	“Transition to a different type of care.”
“Further care is futile.”	“We will make sure he or she is comfortable and cared for.”

with palliative care specialists. Two hours of interactive lecture were followed by 2 hours of supervised role-play exercises that covered the basic behaviors and phrases of effective and empathetic communication, and identifying phrases that undercut conversational rapport.

The training focused on the interplay of 3 techniques: Ask-Tell-Ask, SPIKES, and NURSE. Ask-Tell-Ask is the most fundamental method—asking what is understood, delivering the bad news, and asking for questions before concluding the conversation. SPIKES takes a step further with its approach of “setup, perception, invitation, knowledge, emotions, summarize.” The intent is to arrange a quiet and comfortable setting before the family member’s perception of the situation is assessed. An invitation to share information is obtained, and the bad news is broken. When an emotion is expressed, the NURSE method (name, understand, respect, support, explore) can be employed by naming the emotion, seeking to understand its origin, validating the expressed feelings, supporting the individual’s right to feel this way, and encouraging the family member to further explore his or her feelings. As emotions emerge and are addressed, SPIKES reenters

to facilitate a summary of the discussion and to deliberate on next steps.^{5–7} When teaching these communication techniques, the objective is to break them down into memorable phrases and behaviors to allow for easy recall, customization, and combination, tailored to a given situational context (FIGURE 2). Within 3 days of the didactic and role-play sessions, the postintervention simulation was conducted in a manner identical to the preintervention simulation and family discussion.

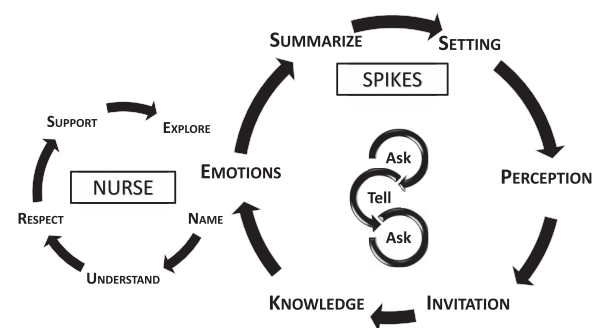


FIGURE 2
Essential Interplay Among 3 Techniques for Breaking Bad News^{6,7}

One point was scored for each checkbox marked, with the interobserver average for each checklist being the participant's final score. No concordance analysis between observers was performed. The Wilcoxon signed rank test was selected as the most appropriate test because the ordinal data were nonparametric with a small sample size ($n = 18$) and a goal of detecting differences between populations (pretest and posttest) on a repeated-measures basis. The 2-tailed significance level was $< .05$ for all calculations.

The Loyola University Medical Center Institutional Review Board declared this project exempt from review.

Results

Across the 3 years of the study, all 18 neurology residents were assessed (100% participation). Statistically significant differences were found between preintervention and postintervention scores in all 3 areas of evaluation. Clinical assessment checklist totals increased from an average of 6.7 to 11.4 out of 15 possible items (45%–76%, $P < .001$), and the apnea test checklist totals increased from 5.1 to 8.3 of 9 possible items (57%–92%, $P < .001$). The nonverbal and verbal communication skills checklist totals increased from 12.4 to 19.7 of 25 possible items (46%–73%, $P < .001$). The average observer scores by participant can be found in FIGURE 3.

Feedback from residents was strongly positive, with participants finding the experience valuable when informally polled 1 year after the intervention. In terms of time and staffing requirements, preparing lectures for the didactic session was the most time-consuming, requiring several hours for each of the 2 presentations. Each intervention (pre and post) required 2 hours from 3 to 4 attending physicians, a standardized patient for 2 hours, and 3 hours from 3 to 4 resident participants.

Discussion

Our findings confirm the notion that effective communication, and the approach to teaching it, are skills that can be taught. Although simulations to train residents in making the diagnosis of brain death are relatively common, the added communication component makes our intervention unique. In addition, our didactic intervention requires less time than previously described protocols for this clinical context.^{5,6,8,9}

This simulation intervention of diagnostic assessment of a brain death scenario and a communications skills exercise joins other initiatives in

demonstrating a benefit to dedicated communication training. There are several important differences. Prior research has shown that the Oncotalk retreat, started in 2002 with a grant from the National Cancer Institute, significantly improved the performance of oncology fellows in the use of the SPIKES and NURSE mnemonics with standardized patients. This training required a 4-day retreat with extensive faculty preparation and third-party coders to score participants via audiovisual recordings of standardized encounters.^{5,6} The Belgian Interuniversity Curriculum significantly improved participants' ability to break bad news to oncology standardized patients, yet it required 40 hours of communication skills training and stress management over 8 months, and computerized audio analysis of verbal utterance type and content.⁸ An intervention at the American University of Beirut employed a shorter 4-hour didactic course discussing adverse events from an anesthesia perspective, with standardized encounters videotaped and assessed via a communication checklist.¹⁰ Both reduced the time required for effective communication training, but the time requirement was still extensive. In contrast, our intervention used the SPIKES and NURSE material, and it was feasible with a lower time and staffing commitment. Our results confirm the feasibility of using short didactic sessions for effective communication skills training.

Limitations of our study include a small number of participants at a single institution, checklists lacking validity evidence, lack of interobserver concordance analysis, and the absence of assessment of skill retention or performance in real-world situations, with all reducing generalizability to other settings. Limited faculty and facility availability have prevented delayed retesting of residents, leaving the long-term efficacy of the program unknown.

Next steps will include retesting previously trained residents to determine whether the simulation is efficacious in the long term. Finally, the diagnosis of brain death is within the scope of practice of numerous subspecialties, and expansion of this intervention to trainees in critical care, trauma surgery, neurological surgery, and anesthesiology may be a beneficial.

Conclusion

An intervention combining didactics and simulation significantly improved the performance of neurology residents in accurately making the diagnosis of brain death, and effectively delivering the news of this diagnosis to a patient's family member.

	PRETEST		POSTTEST		PRETEST			POSTTEST		
	Clinical assesment (15)	Clinical assesment (15)	Apnea test (9)	Apnea test (9)	Non-Verbal (4)	Verbal (21)	TOTAL (25)	Non Verbal (4)	Verbal (21)	TOTAL (25)
2015 - Participant 1	6.0	11.0	5.7	8.0	4.0	6.0	10.0	4.0	22.0	26.0
2015 - Participant 2	12.0	14.0	7.0	9.0	4.0	9.0	13.0	4.0	8.0	12.0
2015 - Participant 3	8.0	12.0	7.0	9.0	4.0	10.0	14.0	4.0	10.0	14.0
2015 - Participant 4	6.3	9.0	6.0	8.0	4.0	6.0	10.0	4.0	16.0	20.0
2015 - Participant 5	7.7	11.0	3.0	7.0	4.0	12.0	16.0	4.0	22.0	26.0
2015 - Participant 6	8.3	13.0	6.0	8.0	4.0	9.0	13.0	4.0	23.0	27.0
2015 Average	8.1	11.7	5.8	8.2	4.0	8.7	12.7	4.0	16.8	20.8
2016 - Participant 1	6.0	15.0	6.0	9.0	4.0	8.0	12.0	4.0	23.0	27.0
2016 - Participant 2	4.0	12.0	4.0	9.0	4.0	11.0	15.0	4.0	17.0	21.0
2016 - Participant 3	6.0	6.0	4.0	5.0	4.0	13.0	17.0	4.0	9.0	13.0
2016 - Participant 4	6.0	7.0	5.0	9.0	4.0	7.0	11.0	3.0	15.0	18.0
2016 - Participant 5	4.0	11.0	2.0	9.0	4.0	6.0	10.0	4.0	16.0	20.0
2016 - Participant 6	8.0	11.0	4.0	8.0	4.0	11.0	15.0	4.0	11.0	15.0
2016 Average	5.7	10.3	4.2	8.2	4.0	9.3	13.3	3.8	15.2	19.0
2017 - Participant 1	8.0	13.0	5.7	7.7	4.0	9.0	13.0	4.0	16.0	20.0
2017 - Participant 2	5.7	12.3	2.3	7.3	4.0	4.0	8.0	4.0	13.0	17.0
2017 - Participant 3	7.7	13.7	7.3	9.0	4.0	4.0	8.0	4.0	15.0	19.0
2017 - Participant 4	8.0	13.0	6.7	9.0	3.0	5.0	8.0	4.0	15.0	19.0
2017 - Participant 5	3.0	8.7	4.0	9.0	4.0	13.0	17.0	4.0	17.0	21.0
2017 - Participant 6	6.0	11.7	7.0	9.0	4.0	9.0	13.0	4.0	15.0	19.0
2017 Average	6.4	12.1	5.5	8.5	3.8	7.3	11.2	4.0	15.2	19.2
Global Average	6.7	11.4	5.1	8.3	3.9	8.4	12.4	3.9	15.7	19.7

FIGURE 3
Average Scores of Deidentified Participants for Pretest and Posttest Performance on 3 Training Aspects
Note: The value in parentheses next to each column title is the maximum number of points per checklist.

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