

SEAC GRANT PROPOSAL:

PROJECT TITLE: Evaluation of an Educational Intervention to Increase Medical Student Understanding of Brain Death

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CO-INVESTIGATORS: Jonathan Marinaro MD, Cameron Crandall MD, Sylvia Gonzales MS II, Nicole Farrell (NM donor services personnel).

PROJECT BACKGROUND: There are currently greater than 100,000 patients awaiting life saving or life enhancing organs for transplantation and several thousand die annually while on the waiting list.¹ Despite multimodality efforts over the last few decades, the seemingly insurmountable gap between organ supply and demand persists. Strategies employed to minimize the organ wait list include liberalizing criteria for organ suitability, developing strategies for donor management and optimization of organ function, increasing numbers of non-heart beating organ donors, facilitating first person consent programs, and improving public education and perception about donation and brain death.^{2,3}

The importance of continuing educational initiatives cannot be overstated. Many misconceptions exist among laypersons and doctors regarding organ donation and involve the fundamental concept of brain death.^{4,5,6}

Previous studies have shown that one third of relatives of patients diagnosed with brain death did not understand that death had occurred.⁴ This lack of understanding may compound the family members' grief and complicate decision making with regards to organ donation. In one study, next of kin who decided against organ donation had far less understanding of brain death than did next of kin who decided in favor of donation.⁵ Several Studies have shown that patients and their family members often do not equate brain death with death.^{7,8,9}

The responsibility of patient and family education lies in the hands of organ procurement experts as well as in the hands of physicians from diverse specialties that will encounter brain death. They must be equipped to handle the dead or dying patient along with the concerned families and their associated misconceptions. Of course, the success of physicians in educating the public is dependent on the teachers themselves being knowledgeable and consistent with their message. Interestingly, several studies have identified misconceptions and knowledge deficits among physicians who may encounter brain death in their practices. Youngner et al presented healthcare providers involved in the care of brain dead patients with one factual question regarding the definition of brain death and two scenarios in which to apply that definition. Only 63% correctly identified brain death as "irreversible loss of all brain function"; only 35% were able to provide both a correct definition for brain death and an appropriate determination for both scenarios.¹⁰ A more recent study by Harrison and Botkin¹¹, using a similar factual question and a single scenario to assess understanding of brain death among pediatricians found that only 36% (n=42) of residents correctly defined brain death and only 38% of those 42 residents correctly interpreted the scenario; attending pediatricians performed slightly better, with 39% (n=44) providing an accurate definition and 64% of those 44 appropriately interpreting the scenario.

As for most fundamental topics in medicine, arming physicians with vital information usually begins in the early phases of medical education; in medical school. It stands to reason that many

authors have called for or experimented with brain death and organ donation education in the medical school curriculum.^{12,13,14,15} Many of these reports have assessed both medical student and physician level of understanding of issues surrounding organ donation but have not focused on the more fundamental understanding of the concept of “brain death” or “death by neurologic criteria”.^{13,14,16,17,18} All of these studies have identified significant gaps in medical student understanding of both brain death and the organ donation process. One study which measured knowledge among first and second year medical students in Ohio concluded that knowledge regarding brain death was lower among medical students as compared to a random sample of Ohio adults.¹⁶ A study by Connie et al found that out of 126 medical students in Hong Kong, less than half identified that brain death was different than a persistent vegetative state.¹⁷ Similarly, only 36% of Canadian medical students and 35% of a cohort of Brazilian medical students reportedly understood brain death.^{14,18} Neither of these studies measured understanding of brain death with a validated instrument.

A lack of understanding of organ donation among medical students is well established. However, elucidation of student understanding of the more basic concept of brain death remains in question. There are very few studies done in the United States where the medical student curriculum may differ significantly from the countries where the above studies were performed. Further, none of these studies used validated measuring tools. These limitations may be obstacles to advocating for and making curriculum changes in undergraduate medical education to facilitate a better understanding of how the diagnosis of brain death is made.

A recent survey instrument designed to measure understanding of brain death was recently validated to have test-retest reliability, internal consistency and the ability to discriminate between those who do and do not understand brain death.¹⁹

As it is likely that knowledge gaps and understanding of brain death amongst U.S. medical students approximates previous reports of other cohorts, the obvious next challenge is to find an educational intervention that can reliably address these gaps. The PI has already designed a brief video tutorial to help understand brain death by way of reviewing the clinical brain death evaluation. This tool will be used to attempt to increase Brain Death Understanding scores among medical students.

STUDY OBJECTIVES

1. To quantify the level of understanding of brain death among medical students using a validated assessment tool.
2. To implement an educational tool/ intervention into the basic science and clinical curricula.
3. To measure the impact that this educational intervention has on the level of brain death understanding among medical students using the same validated assessment tool.

HYPOTHESES

1. We hypothesize that current medical student understanding of brain death will approximate the level of understanding amongst laypersons (as previously quantified).
2. Secondly, we hypothesize that the level of understanding does not significantly increase at any point throughout a four year medical education at a single institution (UNM HSC).
3. We further hypothesize that implementation of a brief video tutorial in the pre-clinical and clinical medical student curricula, will lead to an increase level of understanding among medical students (as previously quantified in the survey validation study)¹⁹.

OUTCOMES/ IMPACT on UNM SOM: This project is designed to improve the curricula for UNM medical students by identifying a gap in medical knowledge (understanding brain death) and addressing this curriculum deficiency with a brief educational tool, while using sound measurement tools to assess the impact of the intervention.

METHODS:

SUBJECTS: The study subjects will be the UNM medical students.

DATA COLLECTION: We will use the previously validated Understanding Brain Death survey (Figure 1) to assess medical students from all four classes at the University of New Mexico. The survey will be administered through the web based survey tool; Survey Monkey. Basic demographic data and organ donor status will also be collected as well as a short answer question eliciting when and where the respondent acquired his or her current understanding of brain death.

Each member of the class will be given a link to the survey through their GroupWise account. Respondents will be tracked by their GroupWise ID, but they will not be linked to their answers. Therefore, only those people who have not completed the survey will be sent a follow-up email at one week, two weeks, and three weeks. The survey will be open for a total of four weeks for each class.

First years (Phase I-1) will be given the survey at the start of their academic year: August, September or October. This will create a baseline group to which the more senior students can be compared. Second year students (Phase I-2) will be given the survey in April at the end of their second year, which marks the conclusion of their classroom education. Third year students (Phase II) will be surveyed at the end of April to the beginning of May which corresponds to their transition between Phase II and Phase III to insure that everyone has already participated in his or her Neurology rotation. Fourth year students (Phase III) will be surveyed in February to maximize response rate before Match Day.

Once the initial understanding brain death measurements are obtained, the educational intervention will be put in place. A brief (approximately 10 minute brain death video tutorial) will be added at 3 points in the curriculum; once during the pre-clinical neurosciences block, once in the clinical neurology rotation and again during the phase 3 ICU rotations. Commitments from the directors of these 3 rotations have committed to this curriculum addition (see letters). The understanding brain death assessment survey will be repeated in 2 years time. Within that time frame each class will have been exposed to the educational intervention at least once; either in their pre-clinical neurosciences block, or during their Neurology clerkship in phase 2, or during their ICU rotation in phase 3. The previous 4th year students (who will have graduated, will not have the intervention nor will they be retested. (see study schedule/ timeline below)

<u>Year</u>	<u>class of..</u>	<u>initial eval</u>	<u>intervention date</u>	<u>re-eval</u>
1st	2013	2009 Sept	2010 Feb	2011 April
2nd	2012	2010 April	May 2010 - April 2011	2011 April
3rd	2011	2010 April	May 2010 - Feb 2011	2011 March
4th	2010	2010 March	NA	NA

DATA PROCESSING: Study investigators will manage the survey data using an excel spreadsheet that the PI will maintain.

DATA ANALYSIS: We will measure understanding of brain death using a validated five point scale. Based upon prior research, we know that laypersons achieve a mean score of 3.0 (standard deviation (SD) 1.1) and experts achieve mean scores of 4.8 (SD 0.6) on the Understanding Brain

Death assessment tool¹⁹. We believe that an absolute change of 1.0 on the scale is a meaningful difference, in one's understanding of brain death. Assuming 90% power, a two-tailed test, normally distributed data with a conservative standard deviation of 1.25 and a critical value of 5% (conservatively adjusted to 0.83% for multiple comparisons using the Bonferroni procedure (six pairwise comparisons between the four years)), then we estimate needing approximately 50 subjects in the baseline group (laypersons, first year students) and 50 subjects in the 'expert' group (2nd, 3rd and 4th year students). In practice, we anticipate enrolling approximately 50 subjects per class year and will have adequate power to detect differences between each class.

The summed BDE scale values will be calculated and graphically displayed for each medical school year. We will summarize responses using mean and median estimates of central tendency and standard deviation and inter-quartile range estimates for spread. To test hypothesis number one, we will compare mean values of all subject to the null value of 3.0 (level of the layperson). To test hypothesis number two, we will use analysis of variance (ANOVA) with an appropriate multiple comparisons procedure (such as Tukey's Honestly Significant Difference) to detect differences in mean scores by year. To test hypothesis number three, we will use a paired analysis, comparing pre- and post-intervention BDE knowledge scores. We will compare the difference in pre- and post-intervention scores to the null value of zero using a t-test procedure. If differences appear by year of training, we will use an analogous ANOVA procedure as described for hypothesis number two.

EVALUATION/ MEASURE of SUCCESS:

Goal: To improve the level of understanding of brain death among UNM medical students.

<u>Desired Outcome/ Measurable Objective /</u>	<u>Evaluation Measure</u>
An increase in understanding brain death after implementation of an educational tool	A change in score on the Understanding Brain Death Assessment Tool \geq 1 across all 4 years.

TIMELINE: Initial assessment in year 1----- study intervention----- re-assessment in year 2

BUDGET:

- Salary support: 2% per year = \$3,749/year x 2 years = \$7,498
- Survey Monkey tool (for survey to be active over 2 years) = \$400
- Gift certificates for survey completion= \$100/yr x2 years = 200
- Videographer services to edit video for different med school classes = \$1,500
- Office supplies = \$200

TOTAL = \$9,798.00

PERSONNEL: Drs. Marinaro, Saland, and Edmunds will be assuring the successful institution of the study intervention (the video tutorial) within their respective curricula. Dr. Crandall will be integral in data analysis. Dr Tawil and Sylvia Gonzales will be involved in all aspects of the study. Nicole Farrell (a future medical student and donor services employee) will be a research assistant throughout the project.

APPENDIX

- Appendix 1. References
- Appendix 2. Understanding Brain Death Survey
- Appendix 3. Brain Death Evaluation Video Tutorial

Appendix #1.

References

- ¹ The United Network for Organ Sharing. <http://www.unos.org>. Accessed 5/09.
- ² Gridelli B, Remuzzi G. Strategies for making more organs available for transplantation. *NEJM* 2000;343(6):404-410
- ³ Abouna GM. Organ shortage crisis: problems and possible solutions. *Transplant Proc.* 2008 Jan-Feb;40(1):34-8
- ⁴ Pearson IY, Bazeley P, Spencer-Plane T, Chapman JR, Robertson P. A survey of families of brain dead patients. Their experiences, attitudes to organ donation and transplantation. *Anesthesia and Intensive Care* 1995;23:88-95
- ⁵ Omrod JA, Ryder T, Chadwick RJ, Bonner SM. Experiences of families when a relative is diagnosed brain stem dead: understanding death, observation of brain stem death testing and attitudes to organ donation. *Anaesthesia* 2005; 60:1002-1008
- ⁶ Franz HG, DeJong W, Wolfe SM, Nathan H, Payne D, Reitsma W, Beasley C. Explaining brain death: a critical feature of the organ donation process. *J Transplant Coord.* 1997;7:14-21
- ⁷ Siminoff LA, Mercer MB, Arnold R. Families' understanding of brain death. *Prog Transplant* 2003;13:218-224.
- ⁸ Tessmer CS, da Silva AR, Barcellos FC, Araujo CL, da Costa JD, Bohlke M. Do people accept brain death as death? A study in Brazil. *Prog Transplant* 2007;17:63-67.
- ⁹ Long T, Sque M, Addington-Hall J. What does a diagnosis of brain death mean to family members approached about organ donation? A review of the literature. *Prog Transplant* 2008;18:118-126.
- ¹⁰ Youngner SJ, Landefeld S, Coulton CJ, Juknialis BW, Leary M. Brain death and organ retrieval: A cross-sectional survey of knowledge and concepts among health professionals. *JAMA* 1989;261:2205-2210.
- ¹¹ Harrison AM, Botkin JR. Can pediatricians define and apply the concept of brain death? *Pediatrics* 1999;103:e82
- ¹² Feeley TH, Tamburlin J, Vincent DE. An educational intervention on organ and tissue donation for first year medical students. *Prog in Transplant*;2008;18(2)103-8
- ¹³ Schaeffner ES, Windisch W, Freidel K, Breitenfeldt K, Winkelmayr W. Knowledge and attitude regarding organ donation among medical student and physicians. *Transplantation* 2004;77(11) 1714-18
- ¹⁴ Bardell T, Hunter DJW, Kent WDT, Jain MK. Do medical students have the knowledge needed to maximize organ donation rates? *Can J Surg.* 2003;46(6):453-8
- ¹⁵ Garcia CD, Barboza AP, Goldani AP et al. Educational program of organ donation and transplantation at medical school. *Transplant Proc.* 2008 May;40(4):1068-9
- ¹⁶ Essman C, Thornton J. Assessing medical student knowledge, attitudes, and behaviors regarding organ donation. *Transplant Proc.* 2006 Nov;38(9):2745-50
- ¹⁷ Connie FO, Kelvin LK, Chung AC, Diana CM, Gilberto LK. Knowledge, acceptance and perception towards brainstem death among medical students in Hong Kong: a questionnaire survey on brainstem death. *Med Teach* 2008 Jun;30(5):e125-30
- ¹⁸ Alfonso RC, Buttros DA, Sakabe D, ParanhosGC, Carcia LM, Resende MB, Ferraz-Neto BH. Future doctors and brain death: what is the prognosis? *Transplant Proc.* 2004 May;36(4)816-7
- ¹⁹ Tawil I, Marinaro J, Brown LH. Development and validation of a tool for assessing understanding of brain death. *Prog in Transplant.* 2009 in press

Appendix #2.

Figure 1:

Medical School Class: pull down by year of graduation

Age: fill in the blank

Ethnicity: pull down (Hispanic, non-Hispanic white, African-American, Native American, Asian descent)

Gender: pull down (male or female) Organ Donor status: pull down (Yes or No)

1. Can someone who is brain dead breathe without the support of the breathing machine?

Choose: Yes No Unsure

2. Can someone who is brain dead ever wake up (recover)?

Choose: Yes No Unsure

3. Will someone who is brain dead react (grimace, move away or blink) if someone touches their eyeball?

Choose: Yes No Unsure

4. Can a person be brain dead even if their heart is beating?

Choose: Yes No Unsure

5. Is brain death different from a coma or a vegetative state?

Choose: Yes No Unsure

When and where (in what setting/ circumstance) did you gain your current understanding of brain death? (please answer both when & where.)