

Neuroethics In Neuroscience Series: Location of the Soul and Acceptance of Brain Death in the East and West

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Introduction

In February 1999, two years after Japan legalized the concept of brain death, a 40-year-old woman with a ruptured brain aneurysm was admitted to Kochi Red Cross Hospital and eventually lapsed into a deep coma. Her family, respecting the patient's wishes because she carried an organ donor card, gave consent for brain death exam and organ donation. This became the first brain death declaration and donation after brain death (DBD) in Japan. Overnight, Kochi, a quiet fishing town on the Pacific coast, became the center of national attention. Amid fervent media reports, the brain death exam was performed, inciting controversy and doubt as the first run revealed residual electroencephalographic signals. The exam was repeated two more times, each with confirmatory tests. The heart, liver, two kidneys and corneas were harvested and flown to five hospitals, one as far as Nagano Prefecture in the Northeast. The heart transplant was the first in 31 years. The physicians involved in the initial attempt of 1968 were prosecuted for murder. When the recipient of the heart of the Kochi woman, a 41-year-old Osaka businessman suffering from hypertrophic cardiomyopathy, woke up from anesthesia, a local newspaper trium-

phantly declared, "Medicine in Japan has entered a new era." [1]

In February 2003, a 61-year-old man collapsed from a brain stem hemorrhage while watching his son's wedding video at home in Wuhan, China. He was admitted to Tongji Hospital on ventilator and vasopressor support. Even though the Chinese neurointensive care community had drafted a guideline for brain death diagnosis as early as 1986, and a group of transplant surgeons had proposed a bill for recognizing brain death in 1999, both documents were repudiated by the Ministry of Health on the grounds that the country "was not ready" [2]. As a leader in the debate, Tongji Hospital had been preparing to make the first officially declared brain death diagnosis in China. Persuaded by the hospital, the man's son, a candidate party member, agreed to the brain death exam and terminal extubation. The decision was praised as "the highest level of enlightenment, demonstrating moral character, rationality, and righteousness," by Dr. Suming Zhang, the attending neurologist [3]. The entire process was recorded and televised. It took 21 minutes from extubation to cardiac arrest.

Brain Death Data

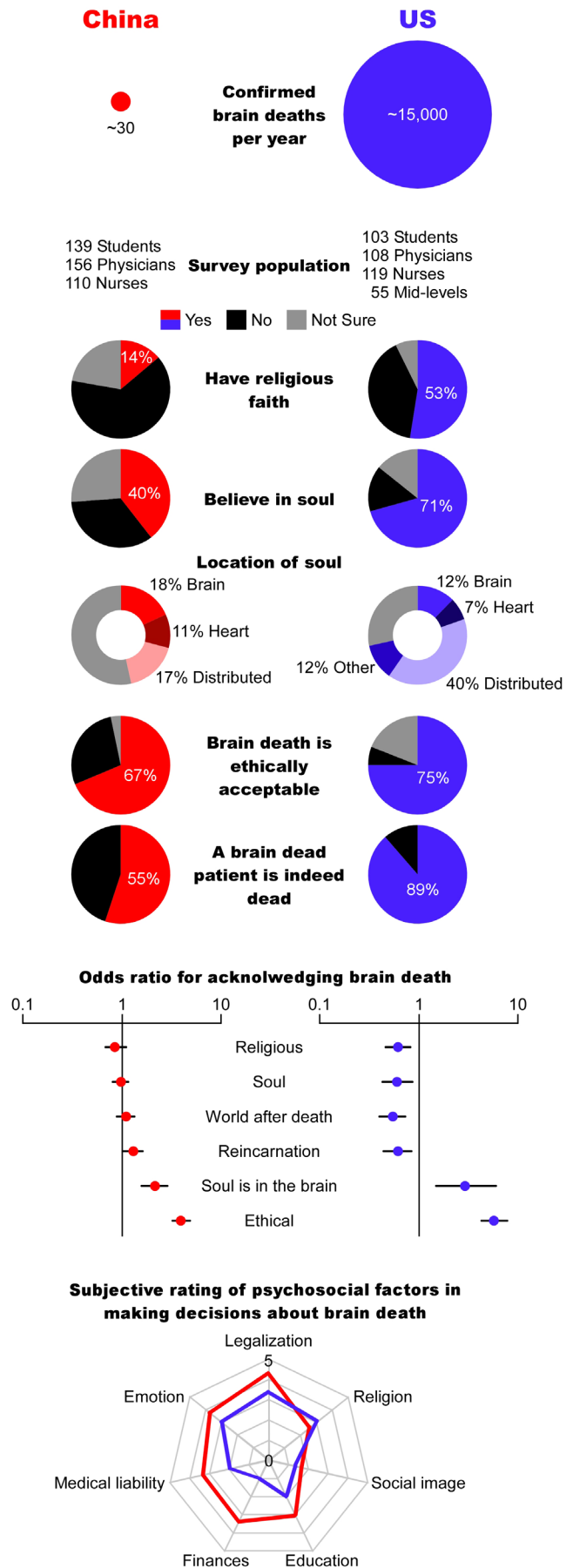
More than a decade has passed since these historic moments. During this time, 268 brain deaths were declared in Japan and 267 led to organ transplant [4]. In 2010, Japan revised its law, expanding the brain death criteria to children and relaxed the requirement for familial consent [5]. This increased the number of confirmed brain deaths, to 47 in 2013, which accounted for 56% of the deceased donor pool [4]. China still lacks a law and a national guideline for declaring brain death. Without official records, published brain death cases add up to less than 200 [6]. The 61 documented DBD account for a negligible portion of all deceased donor transplants in China, where death-sentenced prisoners served as the main organ source [2]. In the US, where Kansas pioneered brain death legalization in 1970, the number of declared brain deaths is estimated at 15,000-20,000 *per year* [7] (Figure, top section). In 2012 alone, there were 7,701 DBDs, comprising 87% of all deceased donors [8,9].

East Asian countries, exemplified by China and Japan, have lagged behind the West in granting legal justification for brain death and incorporating the concept into medical practice [10]. Cultural and religious traditions are often referenced to explain this apparent difference. At the center of the debate is the definition of personhood related to the location of the soul [11].

Philosophy of Brain Death

The Western idea of dichotomy between body and soul traces back to Socrates [12]. For Plato, the soul was a pure spiritual existence temporarily imprisoned in the body. For Descartes, the essence of personhood is cognition. He equated the soul with the conscious

Figure: Comparison of estimated brain deaths per year between China and the US, and results of an empirical survey on the medical providers' acceptance of brain death.



mind, and the body with an organic machine [13]. As the seat of rational thoughts and the integrator and regulator of bodily functions, the brain occupies a prominent place in Western philosophy [14,15]. Masterly elevation of the brain and degradation of the physical body to mere tools serving the mind is one of the major theoretical foundations of brain death [16]. Many in the West believe that when whole brain function is irreversibly lost, the soul ceases co-existence with the physical body, and the person is dead [12,16].

In Western religions, personhood is defined through the distinctly brain-oriented abilities to consciously perceive, make decisions, and interact with the world, among others [17-20]. The phrase “physiological decapitation” has been used to describe brain death in Christian, Judaic, and Muslim vernaculars [17,19-21]. With the exception of some Orthodox Jews who maintain that the soul resides in the heart, all three religions have endorsed the concept of brain death [17,18,20,22].

Eastern philosophies do not offer a clear body-mind separation [23,24]. Shintoism understands human life within the context of nature, intimately coexisting with mountains, rivers, plants and animals [23]. Taoism also advocates accepting the laws of nature, albeit often mysterious. In this cosmos, death represents a gradual process with disintegration of both the physical and spiritual existences [23-25]. Whereas the rationalist Westerner sees brain death as a clear-cut diagnosis, Easterners lament that “in a state where only the brain has completely lost its function but other parts of the body keep on living, the boundary between life and death is extremely ambiguous.” [1]

The brain does not occupy a special position as the dominant organ in Eastern beliefs. Traditional Chinese Medicine teaches that the human body is a system of correspondence, rather than a system of causation [15]. Vital functions result from interactions among all organ systems; the brain neither controls nor

integrates. In Buddhism, *alaya-vijnana*, or the eighth consciousness representing one’s personal and collective identity, is distributed throughout the body and not exclusively located in the brain [13,26]. Even in the absence of measurable brain activity, consciousness may still dwell in the body [18,26]. Both Buddhism and Confucianism also see body heat as the outward expression of vitality and a tangible sign of life [24,26]. Furthermore, none of the authority figures for the Eastern religions have announced a definitive opinion for or against brain death.

Current Beliefs About Brain Death

Although consistent with the extents of brain death practice observed in Eastern and Western societies, how much these ideological disparities actually apply in real life remains unknown [11]. To better understand what factors affect in the medical decision-making regarding brain death, my colleagues and I asked 790 medical professionals, including attending and resident physicians, nurses, medical students, and mid-level providers, from academic hospitals in China (n=405) and the US (n=385) about their understanding and acceptance of the brain death concept (Figure, middle section). While the details of this study will be published separately, I want to share a few of the key findings here, especially regarding the role of religion and soul. Based on the above-reviewed analysis of religious and cultural heritages, we expected to see the American providers expressing a brain-centric view about life and soul, which would promote their acceptance of brain death. On the other hand, the Chinese providers would be guided by an integrated view about life, making them reject brain death.

The majority of the respondents reported accepting brain death as an ethical standard to determine human death in both countries (China 68.6% vs. US 75.1%, p=0.043); however, more providers in the US were willing

to apply the concept to medical practice by acknowledging that a brain dead patient presented in a hypothetical vignette was indeed dead (China 54.7% vs. US 88.6%, $p < 0.001$). Surprisingly, religion accounted for very little of this difference in decision-making.

For the Chinese, *none* of the following factors – possession of religious faith (13.8%, most commonly Buddhism, followed by Chinese folk religion and Taoism), belief in the existence of soul (39.5%), belief in a world after death (26.9%), and belief in reincarnation (23.3%) – correlated with the ethical acceptance or operational acknowledgement of brain death. Among the believers of soul, 18.3% localized it to the brain, followed by distributed throughout the body (16.5%) and heart (11.1%). Localization of the soul was unrelated to other spiritual practices. Believing that the soul resided in the brain did not affect ethical acceptance, but it had significant predictive power for acknowledging brain death (OR 2.11, 95% CI 1.54-2.90, $p < 0.001$).

American medical providers were more religious and spiritual than their Chinese counterparts. However, possession of religious faith (52.5%, predominantly Christianity, followed by a small portion of Judaism and Hinduism), belief in soul (70.6%), belief in a world after death (51.9%), and reincarnation (22.3%) still did not correlate with ethical acceptance and actually had mildly negative predictive power for the operational acknowledgement of brain death. Contrary to conventional perceptions, the most popular location of the soul, regardless of religious faith, was distributed throughout the body (39.9%), followed by brain (12.4%), and other (11.8%, examples are abdomen, outside of the body, and no physical location). Similar to the Chinese sample, localizing the soul to the brain did not foster ethical acceptance but encouraged the acknowledgement of brain death in the hypothetical patient (OR 2.94, 95% CI 1.48-6.01, $p = 0.001$).

As our data suggest, while putting the soul in the brain significantly increases the likelihood of applying the brain death concept to practice; medical professionals in both China and the US likely arrived at the soul-brain connection independent of the religious traditions attributed to the two societies, and the belief itself is not unique to or representative of either culture. The polarized view of body-soul separation with the dominant brain in the West, versus body-nature integration with the ambiguous spirit in the East, fails to adequately explain the resistance to brain death in China.

Interestingly, when asked to rate the importance of various psychosocial factors in making decisions about brain death, religion was ranked the second highest by Americans but the second lowest by Chinese (Figure, bottom section). Respondents from both countries ranked the legal status of brain death the most important. This suggests that the focus on religious beliefs in the debate about East-West differences in brain death may be itself a construct of the West.

Our pilot study has further elucidated that other considerations, including the providers' level of knowledge about brain death, their past professional and life experiences, the practice environment and trust in the medical system, the patients' financial status, and emotional connections between patients, family members, and providers, play crucial roles in the decision making process. Many are shared by providers from both regions, but prioritized differently. Some exert an indirect effect by improving the understanding of the physiological basis of brain death and its ethical acceptance. Although our study is limited because a sample of highly educated medical professionals cannot represent opinions of the general public in their respective countries, we had hoped to illustrate the complexity of the choices made for brain dead patients and the subtlety of cultural inferences.

Conclusions

The discovery (some say invention) of brain death is a prime example of how neuroscience revolutionized medicine and the perception of life in the past half century [27,28]. Originated in the Intensive Care Units of the post-WWII West, the concept is slowly but steadily propagating through the rest of the world [10,27]. Its wavefront intercepts with the existing social norms, practices, beliefs, and interpersonal relationships, stirring up eddies of controversy. This will not be the last time neuroscience brings changes unanticipated by Socrates or Confucius. The raw emotions of those going through the agonizing decisions and their attempts at rationalizing intuitions may not fit the boxes constructed by ancient sages. To recognize and embrace the human experiences will be the key for communicating across cultures as we move forward.

Acknowledgment

I would like to thank Dr. Geoffrey Miller, Department of Pediatrics, Yale School of Medicine, for his mentorship and support, and Dr. Xin Li, Department of Hematology, Xiangya School of Medicine, for her advice on the survey study. I also thank Yi Fan and Qian Cheng, students at Xiangya School of Medicine, and Jennifer Guo, student at Yale School of Medicine, for contributing to survey coding, interpretation, and discussion.

The Chinese data were collected with help from the following people at Xiangya School of Medicine: Dr. Lingyun Zhang, Department of Neurosurgery, Dr. He Zhang and Dr. Fangfang Bi, Department of Neurology, Dr. Zhenying Liu, Department of Psychiatry, Prof. Xing Liu, Department of Bioethics, and Prof. Lin Li, Department of Nursing. The American data were collected with help from the following people at Yale School of Medicine: Dr. Richard Gusberg and Dr. Peter Yoo, Department of Surgery, Dr. Mark Siegel and Dr. Victor Morris, Department of Internal Medicine, Dr. Charles Duncan, Department of Neurosurgery, and Prof. Janet Parkosewich, Office of Nursing Research. Funding came from Penn Fellowship for Neuroscience and Society, Yale Office of International Medical Student Research, and Yale-China Association.

Biography

Qing Yang (qing.yang@yale.edu) is an MD/PhD student at Yale School of Medicine. She received a BS in biology from Yale University in 2006. She worked on the mechanisms of axon guidance and neuronal regeneration for her PhD thesis and has a keen interest in the social implications of neuroscience. Lately she has been exploring how cultures affect the way people think about diagnoses and treatments. After completing an intern year at Yale New Haven Hospital, she will be moving to Boston for residency in anesthesiology at Massachusetts General Hospital.

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Editor's Column

Welcome to the 84th edition of the *Kopf Carrier*. In the article presented here, Qing Yang, an MD/Ph.D. student at Yale University School of Medicine provides us with a very

interesting look at the concepts of brain death and how it is perceived in China and the United States. In the US, and indeed in the rest of the world, the discoveries coming out of the neuroscience community are remaking the very foundations of what constitutes brain death and associated brain states, such as locked in syndrome. However, Dr. Yang explores another avenue of thinking about brain death in her essay. She looks at how belief systems and philosophies of what constitutes soul, mind and body interact to allow the acceptance of brain death in an individual and by the caregivers who must determine brain death. Her findings are very unusual and surprising and show how the dominant philosophies of a region pervade the perceptions of what alive and dead are.

Ms Yang's essay won second place in the student essay contest at last year's International Neuroethics Society (INS) meetings in Washington, DC. The INS promotes a greater understanding of the role of ethics in the field of Neuroscience. From the INS website, the society's mission is "to promote the development and responsible application of neuroscience through interdisciplinary and international research, education, outreach and public engagement for the benefit of people of all nations, ethnicities, and cultures." The society was formed in 2006 and has engaged a growing number of professionals and students nationally and internationally in the integration of ethics in the application of information coming from the neuroscience community. This year, the INS meeting will be held in Chicago on October 15 and 16, just before the Society for Neuroscience meetings. I urge you to go to the INS website (www.neuroethicssociety.org)

for more information, including registration forms. The meetings are both interesting and informative.

Here in Florida, the hurricane season is about to begin. However, the first named storm has already come and gone. Tropical Storm Ana formed in early May off the east coast of Florida and slowly drifted north, finally making landfall in South and North Carolina, as a rainmaker rather than doing much damage. The forecast for the hurricane season is for a fairly quiet season with nine named storms, five hurricanes and one major hurricane expected. However, it takes only one hitting where we live to make it a bad season. We will hope that the predictions are about right and that Florida is again spared even that one.

David Kopf Instruments continues to do well, producing the very best and most versatile stereotaxic instruments and accessories in the world. With excellent products and superb manufacturing facilities located in Tujunga, California, the company stands ready to fulfill all your stereotaxic needs. In addition, should your Kopf instrument need refurbishing, due to wear or accident, the company will do the necessary work to bring it back to original condition for a reasonable cost.

I invite our readers to write an article for the *Carrier*. Articles can be about a novel technique, stereotaxic or otherwise that you use in your lab, a historical vignette in neuroscience, or any other topic that would be of interest to the neuroscience community. There is a stipend for each published article, and the author retains copyright. If you or your graduate student/s want to write an article, please contact me for further information.

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