

East–West Differences in Perception of Brain Death

Review of History, Current Understandings, and Directions for Future Research

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Abstract The concept of brain death as equivalent to cardiopulmonary death was initially conceived following developments in neuroscience, critical care, and transplant technology. It is now a routine part of medicine in Western countries, including the United States. In contrast, Eastern countries have been reluctant to incorporate brain death into legislation and medical practice. Several countries, most notably China, still lack laws recognizing brain death and national medical standards for making the diagnosis. The perception is that Asians are less likely to approve of brain death or organ transplant from brain dead donors. Cultural and religious traditions have been referenced to explain this apparent difference. In the West, the status of the brain as home to the soul in Enlightenment philosophy, combined with pragmatism and utilitarianism, supports the concept of brain death. In the East, the integration of body with spirit and nature in Buddhist and folk beliefs, along with the Confucian social structure that builds upon interpersonal relationships, argues against brain death. However, it is unclear whether these reasoning strategies are explicitly used when families and medical providers are faced with acknowledging brain death. Their decisions are more likely to involve a prioritization of values and a

rationalization of intuitive responses. Why and whether there might be differences between East and West in the acceptance of the brain death concept requires further empirical testing, which would help inform policy-making and facilitate communication between providers and patients from different cultural and ethnic backgrounds.

Keywords Brain death · Cultural differences · Religion · Philosophy · Asia

Introduction

Human death triggers a series of emotional, social, and legal ramifications such as grieving, funeral arrangements, division of estate, succession of public office, discontinuation of resuscitative efforts, and removal of organs. It is thus a required social necessity for there to be agreement on when death has occurred and when we can declare that death has occurred (Miller 2011). The determination of death and its declaration relies as much on biological knowledge as on social consensus and communal acceptance. For the majority of history, death has been identified by the irreversible absence of a heartbeat and respiration. Brain death, defined as the permanent and irreversible loss of function in the brain as a whole or in the brain stem in some jurisdictions (such as the United Kingdom), emerged as an alternative criterion in the mid-20th century. The brain death doctrine serves two purposes: (1) the disposition of ventilated patients with the diagnosis and (2) the potential for

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organ donation from an individual with a beating heart (Truog 1997). It was not introduced as an attempt to redefine death, but as a way of determining death that is acceptable as equivalent to the cardiopulmonary criterion, especially when the use of ventilators obscures accurate evaluation of cardiopulmonary function (Becher 1968; President's Commission 1981; Miller and Ashwal 2010). Since the middle of the last century, it has been widely validated and become a routine part of medical practice in the United States as well as other Western countries (Gardiner et al. 2012; Wijdicks 2002).

Ethical issues associated with the concept of brain death have been extensively reviewed elsewhere (for example, President's Council 2011). These include the role of the brain in defining the biological and philosophical meanings of life, the value of brain death as either a real physiological state or an artificial construct, the truthfulness of the belief that equates brain death with the end of life, the justice of minimizing futile medical care, and the social utility of providing organs for transplant. Although it is not the aim of this article to justify the use of the brain death concept, we will briefly review, from the start, some of the ethical arguments concerning its application.

When we consider the concept of brain death as equivalent to cardiopulmonary death, there are valid criticisms that highlight the flaws in the brain death doctrine (Shewmon 2001; Nair-Collins 2010). Most people do not have difficulty in appreciating that death exists. The debate concerns when it occurs, how it is recognized, and when and how it may be declared. In the biological and medical realm we debate the nature and recognition of death, and in the sociocultural, political, and legal realms it is the acceptability of the declaration of death that comes into play. In the case of brain death, those involved are asked to accept that an individual with an irreversible loss of functional whole brain activity would be dead without artificial ventilation, and spontaneous ventilation will inevitably fail. The skeptical may say that the individual is not yet dead, but will be once the artificial ventilation is removed. Or they may not believe that the individual is dead by what they can see and feel, which is not a corpse, and they would be correct. The features that determine when brain death may be declared are not identical to how a typical individual views a biological death. It is for this reason that, in the United States, the President's Council on Bioethics recommended the use of the term "total brain failure" rather than brain death (2011). The judgment

then to allow a declaration of death when irreversible total brain failure is reliably determined might be viewed as a value judgment. But it is not for the physician to enter into a philosophical discussion on the meaning of death with the patient's relatives. We recognize that the physician's skillful communication often follows the logic of: (1) There is no evidence of functional brain activity; (2) this condition is permanent; and (3) this allows a declaration of death. To some this supports a fiction. It also leaves the physician open to accusations of paternalism and being disingenuous. Lederer writes: "[P]hysicians would benefit from a more coherent and defensible ethical account of vital organ donation" (Lederer 2008, 3).

We suggest that the acceptance of the notion of brain death may rest on, among other factors, the fiduciary relationship between physicians, patients, and their surrogates, as well as the fiduciary relationship between physicians and the state. If the surrogates trust the physicians and their methods and trust that death is inevitable, they are more likely to accept a declaration of death when informed that total brain failure or brain death has occurred. The arrangement for organ donation, although an important consideration, is not the only good that can occur with the acceptance of the brain death doctrine. It allows the removal of artificial ventilation and the arrangements for the procedures that take place following death. This practice of the brain death doctrine also depends on the fiduciary relationship between the state and the medical profession. For example, in the United States, the state, through the legislature, acknowledges death when there is irreversible cessation of either cardiopulmonary function or whole brain function, including the brain stem. The determination of these conditions is the prerogative of the medical profession. So it can be claimed that the acceptance of a declaration of death when irreversible whole brain failure occurs is a matter of public policy and a socio-medico-legal contrivance (Nair-Collins 2010). But there are strong arguments to support the forgoing of life-sustaining treatments from individuals with permanent whole brain failure, and it is neither disrespectful to the individual nor a great moral harm to declare death when this irreversible state is recognized. Overall, mainstream Western society acknowledges that the concept of brain death is morally reasonable, operationally useful, and not intuitively offensive (Miller 2011; Gardiner et al. 2012).

Here we refrain from further discussion on the ethical righteousness of the concept. Instead we are curious

about how cultural contexts influence the perception and application of brain death, because unlike the universally upheld cardiopulmonary standard, practice of the neurological standard of death lacks a global consensus (Wijdicks 2002). We aim to provide an expository comparison of the reception and adaptation of brain death in two culturally distinct societies: East and West.

For the purpose of this study, we define the two cultural camps with somewhat arbitrarily demarcated but readily recognizable geographical areas. We think of the West as North America, Western and Northern Europe (original members of the European Union), plus Australia and New Zealand. These 22 countries are largely populated by Caucasian diasporas and share a strong philosophical and political platform stemming from Greek, Roman, and Enlightenment traditions. On the other hand, by East we mean East and Southeast Asia, including China, Japan, South Korea, Taiwan, and the constituents of Association of Southeast Asian Nations (ASEAN). These 14 countries contain Chinese diasporas and have been for the majority of their history under the influence of a cultural heritage that has developed independent of the West.

Following a description of the medical and historical backgrounds, we embark on an inquiry into whether and why there is a difference between the acceptance of brain death in the East and the West. We examine the legal status of brain death, the existence and stringency of medical guidelines for declaring brain death, and the actual incidence of confirmed brain death diagnoses and brain dead organ donors. We also summarize previous studies surveying public opinions about brain death in Eastern and Western countries. Next we review current understandings regarding the source of such behavioral differences, which have focused on the philosophical and religious arguments deemed characteristic of each culture, in support for or against brain death. Lastly, we speculate additional explanations for the observed differences beyond the perspicuous cultural traditions. We offer suggestions for ways to investigate these new hypotheses and briefly address how improved knowledge in this topic can benefit policy-making and promote culturally sensible medical practice.

Historical Perspective

Evolution of the brain death concept is fueled by progress in three areas of medicine: neuroscience, critical

care, and organ transplant (Table 4). As early as the late 19th century, several neurosurgeons observed a cessation of respiration with continued heartbeat in patients with increased intracranial pressure (ICP) (Settergren 2003). In some cases—such as brain abscesses—the respiratory arrest was temporary. In other cases—such as brain tumors, skull fractures, or intracranial hemorrhage—the patient ultimately succumbed to circulatory arrest hours following respiratory arrest (Horsley 1894). The first electroencephalography (EEG) recordings in humans coincided with the discovery that death on the cellular level was attributed to the loss of the cell membrane electrical potential (Crile, Telkes, and Rowland 1930). Radiographic cerebral angiograms further correlated the fall in EEG activity to lack of blood flow to the brain (Crafoord 1939). These technological advances established ways in which death of the nervous system could be detected and characterized. Wertheimer iconoclastically proposed to equate this form of death to the conventional cardiopulmonary death (Wertheimer, Jouviet, and Descotes 1959).

Larger cohorts of putative brain dead patients were not reported until intensive care units (ICU) sprang up in hospitals across Europe and North America (Lofstedt and von Reis 1956). Initially developed during the polio epidemics, artificial ventilation—negative pressure chambers, positive pressure bag-valve systems, and finally mechanical ventilators—was used to sustain patients with respiratory failure (Puri, Puri, and Dellinger 2009; Settergren 2003). It was noted that a particular group of patients, usually with primary neurological pathology, never regained spontaneous respiration (Lofstedt and von Reis 1956). They lacked cranial nerve reflexes, required norepinephrine infusion to maintain blood pressure, failed to show intracranial filling on carotid angiography, and did not exhibit any EEG activity in the cortex or diencephalon (Lofstedt and von Reis 1956; Mollaret and Goulon 1959; Wertheimer, Jouviet, and Descotes 1959). If ventilation was stopped, they rapidly developed cardiac arrest. Even with continued artificial ventilation, the majority of these patients had cardiac arrest within days (Jennett, Gleave, and Wilson 1981). In a 1959 landmark paper, Mollaret and Goulon termed this state of irreversible coma and apnea “*coma dépassé*” (Mollaret and Goulon 1959).

Advances in organ transplant called upon the applicability of the brain death concept to medical practice. Following Carrel’s improved vascular anastomosis, organ transplant stumbled through decades of

unsuccessful attempts until 1954, when the kidney transplant between a pair of identical twins unveiled the crucial role of immunity and tissue typing (Starzl 1964). Development of immunosuppressive therapy, including calcineurin inhibitors, enabled solid organ transplant to take off. Successful homologous transplants of liver (Starzl et al. 1963), lung (Hardy and Webb 1963), and pancreas (Kelly et al. 1967) occurred within a few years of each other. Enthusiasm and anticipation culminated in the climactic first successful heart transplant (Barnard 1967), a procedure soon replicated throughout the developed world. Even though Barnard's donor, who was presumed brain dead, was disconnected from the ventilator and sustained several minutes of cardiac arrest before organ retrieval, discussions for using brain dead patients as organ sources was inevitable. Indeed, a few years earlier, Alexandre had performed the first kidney transplant from a "heart-beating" donor determined to be brain dead based on Mollaret and Goulon's criteria (Machado 2005). Graft ischemia and time to graft function proved superior to cardiac death donors. A sense of urgency surged regarding the status of the brain dead and a consensus was reached quickly in European and North American medical communities. Brain death was officially recognized as human death by the World Medical Association which convened in Sydney in 1968 (Korein 1978; Machado et al. 2007b). This recognition justified the withdrawal of mechanical ventilation. The continuation of respiratory support was recommended only for perfusing organs awaiting procurement (Settergren 2003). In the same year, an Ad Hoc Committee at Harvard published the medical criteria that have guided brain death diagnosis ever since (Beecher 1968).

Although organ transplant gave impetus to the establishment of the brain death standard, some argue that the intersection between the two was by and large coincidental (Machado et al. 2007a; Settergren 2003). Others perceive brain death as an artificial entity solely constructed for the sake of organ procurement (Sharp 2006; Greenberg 2001).

Reception of Brain Death in East and West

After publication of the Harvard Report, brain death was accepted into Western medicine with relatively little controversy (Wikler 1993; Bowman and Richard 2003; Ohnuki-Tierney et al. 1994). In 1970, Kansas

took the first step to legally permit brain death in the United States. The law was introduced by a physician-legislator and approved without substantial debate (Foley 2011). Finland and Portugal pioneered the European trend in 1971 (Haupt and Rudolf 1999; Wijdicks 2002). Following a report written by President Regan's Bioethics Commission in 1981, the *Uniform Determination of Death Act* (UDDA) was drafted and approved by all U.S. states. Authors of the report metaphorically described the brain-oriented criteria as a new window to access the "deeper and more complex reality" of death when technology undermines the validity of traditional vital signs (President's Commission 1981, 33). The United Kingdom focused on the role of the brain stem in maintaining life-sustaining functions and adopted a standard where death could be declared with "permanent functional death of the brain stem" regardless of cortical activities (Anonymous 1976, 1187; Pallis 1982). By the early 1990s, all 22 Western countries had enacted brain death laws and issued medical guidelines on brain death determination (Haupt and Rudolf 1999) (Fig. 1). Other world regions with a strong Western legacy, such as Latin America, also have legislated in favor of brain death (Escudero et al. 2009).

In recent years, debates about brain death in the West have re-emerged and involve the question of whether it is ever sufficient to declare someone dead based on a



Fig. 1 East lags behind the West in terms of the timing of brain death legislation

defunct cerebral cortex leading to a social or philosophical death. Proponents argue that permanent loss of higher brain functions, particularly consciousness and mental capacities, should constitute human death (Devettere 1990; Ray 1991). However, it seems clear that the burial or cremation of a body with spontaneous respiration and a heartbeat is not acceptable, neither is abolishing the dead donor rule, an ethical code requiring donors to be declared dead before organ harvest (Truog and Robinson 2003). Another stream of criticism concerns the rare but well-documented cases of “chronic brain death” (Shewmon 1998b). Patients, who were often children or infants when declared brain dead, have continued to subsist on ventilatory and nutritional support for weeks, even years, suggesting preservation of coordinated functioning in multiple organ systems. President Obama’s Council on Bioethics revisited brain death in 2008. The Council refuted cortical death on the grounds that such a proposal would generate two deaths—death of the personhood and death of the human organism (President’s Council 2011). The Council upheld the present brain death concept, preferring to use the term “total brain failure” and affirming that loss of both consciousness and spontaneous breathing constitutes death. The brain dead state represents the lack of the need, ability, and drive to be receptive to the world and perform self-preserving measures as a whole organism. The Council did not consider patients in “chronic brain death” alive and argued for the withdrawal of interventions. Thus opinions challenging the brain death criteria remain but are in the minority in the West.

In contrast, there has been a marked delay in legally recognizing brain death as human death in the East. Malaysia was the first to pass a brain death legislation in 1993, 25 years after publication of the Harvard Report (Wijdicks 2002). Japan, while as technologically advanced as its Western trade partners, did not have a brain death law until 1997. During Japan’s three decades of debate, several medical teams were accused of murder for performing transplants using brain dead donors (Feldman 1988; Ohnuki-Tierney et al. 1994; Watanabe 2000). The law was a compromise acknowledging brain death only as a premise for organ donation. As of 2013, only six of the 14 Eastern countries legally recognize brain death. Eight have diagnostic guidelines issued by national medical authorities. Six countries, including China, the most populous country and most powerful economic player in Asia, have neither a law nor a guideline.

A closer look at the guidelines of individual countries suggests that Asians have stricter criteria for brain death determination (Haupt and Rudolf 1999; Wijdicks 2002; Devathanan 1985; Kadir 2006; Chen 2000). Seventy-five percent of Eastern countries require two or more physicians to conduct the brain death examination, compared to 45 percent of Western countries. Guidelines from the East also tend to require physicians trained in neurological or intensive care specialties and confirmation by physicians not directly involved in the care of the particular patient. All of the eight Eastern countries with guidelines have specified a mandatory observation time between the first and second brain death examinations. The average length is 13.5 ± 3.15 hours (mean \pm standard error of measurement), the shortest being six hours. In the West, 14 countries have mandated observation time, averaging 7.0 ± 1.56 hours, the shortest being two hours. If the countries that do not mandate observation time were included in the calculation, the average would be 4.45 ± 1.29 hours, roughly one-third of what is required in the East. Interestingly, the portion of countries mandating confirmatory tests for brain death diagnosis was the same in East and West. This may stem from limitations in the availability of technology and trained personnel to carry out these tests. Overall, this apparent tighter stringency in the East may reflect a more cautious stance by the medical community toward brain death.

Fewer brain deaths have been confirmed in the East than the West. In the United States, it is estimated that 15,000–20,000 people are declared dead by the brain death criteria each year, equivalent to an incidence rate of 48–64 per million population and accounting for about 1 percent of all death (Swerdlow 2004). In the United Kingdom, the most recent available data showed 992 confirmed brain deaths in 2010, corresponding to 16 per million (Murphy and Smith 2012). In the same year, 32 people were declared brain dead in Japan, a mere 0.25 per million (Committee on Organ Transplant 2012). Of note, this was already a significant increase compared to seven brain deaths in the previous year, due to a legislative revision in early 2010, which expanded the brain death criteria to children and relaxed the requirement for familial consent (Ikka and Ikegaya 2010). Even though China does not yet legally recognize brain death, a televised brain death exam on a 61-year-old Wuhan man with brain stem hemorrhage in 2003 was reported as the first officially diagnosed case (Song 2003; Niu 2011). Between 2003 and 2009, approximately 200 brain death diagnoses based on individual

hospital protocols were reported, averaging 30 annually, or 0.02 per million (Zhang et al. 2011).

In the United States, among those declared brain dead each year 10,500–13,800 are estimated to have no contraindication to organ donation, and more than half become donors (Sheehy et al. 2003). The number of deceased donors in 2011 was 8,126, with 7,701, or 87 percent, being donations after brain death (UNOS 2013; European Committee on Organ Transplantation 2012). In the United Kingdom, 652 brain dead donors were documented in fiscal year 2011–2012, accounting for 60 percent of all deceased donors (NHS Blood and Transplant 2012). Japan's first official brain dead patient was a 40-year-old Kochi Prefecture woman with a ruptured brain aneurysm in 1999, two years after the passing of the brain death law (Kochi Shinbunsha 2000). In the 13 years that followed, Japan has had a total of 198 brain death diagnoses, 197 of which led to organ procurement (Committee on Organ Transplant 2012). The peculiar legal standard that necessitates brain death examination solely as a premise to organ donation explains the exceptionally high conversion rate (Bagheri 2003). Over this time period, brain dead donors initially accounted for less than 5 percent of the entire deceased donor pool. The proportion dramatically increased to 40 percent after the 2010 revision (Committee on Organ Transplant 2012). In China, 61 brain dead donors were reported between 2003 and 2009 (Zhang et al. 2011). Donations after brain death (DBD) account for a negligible portion of all deceased donors for organ transplant in China, where death-sentenced prisoners serve as the main organ source (Chen 2011; Zhou and Dou 2011). A form of controlled donation after cardiac death (DCD), termed donation after brain death plus cardiac death (DBCD), is occasionally employed to circumvent the legal obstacles to allow organ procurement from presumed brain dead patients (Chen 2011). Tables 1 and 2 compares the epidemiology of brain death and DBD in selected Western and Eastern countries. In summary, these data indicate that Eastern countries have been reluctant to adopt the concept of brain death into legal and medical practice.

Public opinions further elucidate the difference in the integration of brain death into Western and Eastern societies. In a study surveying large demographically representative samples from Japan, the United States, the United Kingdom, Germany, and France, significantly fewer people considered brain death as an appropriate standard for human death in Japan than in the Western

countries (43 percent vs. 60–71 percent) (Minemura, Yamaoka, and Yoshino 2010). A similar study in Ningbo, China, showed a 33 percent approval rate for brain death (Yu and Xing 2009). A significant fraction of the Asian respondents—29 percent in Japan and 57 percent in China, compared to 6–19 percent of Westerners surveyed concurrently—either had not heard of brain death or were not sure what the term meant. Consistent with the above trend, 98 percent of 1,351 randomly selected Ohio residents in the United States have heard of brain death (Siminoff, Burant, and Youngner 2004). Only 16 percent of this study population thought someone declared brain dead was alive. Furthermore, this study included three clinical scenarios representing brain death, coma, and persistent vegetative state (PVS) and asked the respondents to make decisions about declaration of death, withdrawal of life support, and organ donation; 86 percent correctly identified a patient meeting the brain death criteria as dead.

Among hospitalized patients in Kunming, China, 66 percent believed a brain dead person to be still alive (Wang et al. 2013), as did 40 percent of professionals and government officials in Guangdong (Song et al. 2009). Even among the Chinese hospital staff, only 35 percent accepted brain death (Sun, Wang, and Gao 2005). These studies suggest that the general public in the East are less likely to concur that brain death is human death. Confusion and misunderstanding about the concept may contribute to their apparent resistance.

Cultural and Religious Evaluations on the East–West Difference

West

What might explain this apparent difference in acceptance of brain death between East and West? Could it be that the concept of brain death, originally conceived by Westerners out of their technological advances, is inherently incongruent with the East? As one anthropologist put it: “[A]lthough it is framed as if it were highly scientific and thus culture-free, the notion of brain death is culturally constructed” (Ohnuki-Tierney et al. 1994, 234). Many have speculated about this theory, which often appears in the form of overarching statements such as: “The concept of brain death is not fully accepted in China due to long-standing cultural traditions” (Zhang et al. 2011, 1423) and “Cultural resistance is a real issue”

Table 1 Epidemiology of brain death in select countries

Country	Year	Confirmed brain deaths	Brain deaths per million population per year	Source
West				
United States	2012	~15,000–20,000	48–64	(UNOS 2013; Swerdlow 2004)
United Kingdom	2010	992	15.9	(Murphy and Smith 2012)
France	2011	3,174	48.7	(Agence de la Biomedecine 2011)
Spain	2008	2,478	55.4	(Matesanz et al. 2011)
Canada	2011	2,425	72.4	(Canadian Organ Replacement Register 2011)
Australia	2012	~790	34.9	(Organ and Tissue Authority 2012)
East				
Japan	2010	32	0.25	(The Committee on Organ Transplant 2012)
	1997–2012	198	0.098	
PR China	2003–2009	~200	0.019	(Zhou and Dou 2011)
Taiwan	2012	~200 ^a	8.58	(TORSC 2012)
Singapore	2007	86	18.7	(Kwek et al. 2009)
Korea	2007	~250 ^b	4.76	(KNOS 2011; Lee et al. 2009)

^a Estimated based on DBD donor rates. In Taiwan, similar to Japan, brain death only applies to organ donors. In addition, brain death exams are performed for a handful of patients each year who request palliative care measures. All others are declared dead by the traditional cardiopulmonary standard (Y-J. Chiang, CEO of TORSC, pers. comm.)

^b Estimated based on DBD donor numbers and an acceptance rate of 64 percent for organ donation solicitations reported in Lee et al. (2009)

(Lo 2012, S6). Rhetoric surrounding brain death has frequently involved comparing the philosophical and religious traditions in the two hemispheres (Table 3).

Rationality and the dichotomy between body and soul have been identified as two principles of Western philosophy supporting brain death (Bowman and Richard 2003). The idea of the soul existing separately from the body traces back to Socrates (Devettere 1990; Ray 1991). Plato considered the soul as a pure spiritual existence temporarily imprisoned in the body. Descartes further identified the ability to think as the essence of personhood, equating the soul with the conscious mind and the body with an organic machine (Bowman and Richard 2003; Shewmon 1998a). As the seat of rational thoughts, the brain occupies a prominent place in Western philosophy (Ohnuki-Tierney et al. 1994; Korein 1978). This neuro-essentialism can be expressed as “we are our brains” (Reiner 2011, 1; Roskies 2002). The rest of the physical body has been devalued (Bowman and Richard 2003). The brain as the integrator and regulator of bodily functions, one of the theoretical foundations of the initial brain death proposal, also stemmed from the master–tool

relationship between the soul and the body (President’s Commission 1981). Irreversible loss of brain function, demonstrating cessation of the mind’s coexistence with the physical body, indicates death of the person. One transplant surgeon summarized brain death as “permanent loss of integrative functions and consciousness without a chance of returning to meaningful life” (Pratschke et al. 1999, 344). Consistent with this brain-centered definition of life, the majority of Europeans consider life without cognitive capacity not worth living (Demertzi et al. 2011), and many U.S. residents believe that a comatose or vegetative patient is dead (Siminoff, Burant, and Youngner 2004).

Life as a synthesis of body and soul is also instilled through the monotheist Western religions. Life is defined through individuality and personhood, carried in distinctly brain-oriented abilities to believe, make decisions, feel, and interact with the world (Grodin 1994; Arbour, AlGhamdi, and Peters 2012). A body without the soul is no longer a person (Bowman and Richard 2003). The term “physiological decapitation” has been used to describe brain death in Christian, Judaic, and Muslim

Table 2 Epidemiology of brain death in select countries

Country	Year	Brain dead donors	Brain dead donors as % of all deceased donors	Source
West				
United States	2011	7,071	87 %	(European Committee on Organ Transplantation 2012)
United Kingdom	2010	652	60 %	(NHS Blood and Transplant 2012)
France	2011	1,572	96 %	(Agence de la Biomedecine 2011)
Spain	2011	1,550	93 %	(European Committee on Organ Transplantation 2012)
Canada	2011	466	88 %	(European Committee on Organ Transplantation 2012; Canadian Organ Replacement Register 2011)
Australia	2012	277	78 %	(Organ and Tissue Authority 2012)
East				
Japan	1997	4	5 %	(The Committee on Organ Transplant 2012)
	2012	38	40 %	
	1997–2012	197	14 %	
PR China	2003–2009	61	<0.1 %	(Zhou and Dou 2011)
Taiwan	2012	193	100 % ^a	(TORSC 2012)
Singapore	2007	26	100 % ^b	(Kwek et al. 2009)
Korea	2000	52	41 %	(Min et al. 2010; KNOS 2011)
	2011	368	73 %	

^a In Taiwan, only brain dead donors have been used for transplant. No DCD cases have been reported to date (Y-J. Chiang, CEO of TORSC, pers. comm.)

^b In 2007, Singapore's Human Organ Transplant Act only allowed DBD. This was changed in 2009 when a revision of the law allowed DCD

vernaculars (Grodin 1994; Bernat 2005; Fins 1995; Niu 2011). With the exception of Orthodox Jews who maintain that the soul resides in the heart, all three religions

have endorsed the concept of brain death (Bernat 2005). As early as 1957, Pope Pius XII affirmed that physicians have the ultimate authority to set the criteria for death. He

Table 3 Postulated differences in philosophical and religious beliefs of East and West

West	East
Clear body/soul separation	Integrated view of life consisting of body, spirit, and nature
Brain is the dominant organ and location of command and integration functions	No obvious dominant body part
Soul lives in the brain	Spirit is distributed throughout the body
Life can be explained by physical laws	Life is mysterious
Clear boundary between life and death	Ambiguous transition from life to death
Life is to be controlled and planned	Life is to be awed
Desire to control the mode and timing of death	Desire to let death come naturally
Values autonomy	Values interpersonal connections and family-centered approaches

also urged against futile attempts at prolonging life in “hopeless situations” (Korein 1978). Pope John Paul II upheld the whole brain criteria for neurological death (Bresnahan and Mahler 2010). Brain death was accepted by the Chief Rabbinical Councils of Israel and America in 1986 and 1991, respectively (Dorff 2005; Grodin 1994). The Islamic Fiqh Academy permitted the declaration of death with irreversible loss of whole brain function in 1981. The Council of Islamic Jurisprudence officially designated brain death as death in 1986 (Arbour, AlGhamdi, and Peters 2012).

Doctrines of pragmatism and utilitarianism, hallmarks of the industrial West, further provide support for brain death by giving it “great instrumental value” to the society (Fins 1995, 36). Margaret Lock, who published the seminal work comparing the reception of brain death in America and Japan, judged the reasons for establishing the brain death criteria in the Harvard Report as essentially pragmatic: to reduce the burden of futile medicine and to facilitate organ procurement (Lock 1996, 2002). Obsession with planning and controlling one’s body and life events is another prominent characteristic of modern Western society, which manifests in brain death as a way to control the timing and manner of death (Lock 1996; Bowman and Richard 2003). It is desirable and necessary to know when death may be declared, and time and technology affected this.

Interestingly, in the recent debates surrounding brain death legislation in China, the proponents have been vocalizing traditionally Western arguments emphasizing rationality, utility, and societal benefits (Huang, Mao, and Millis 2008; Chen 2002; Ouyang 2004; Wang 2003). On the other hand, the opposition has been quoting originally Eastern beliefs and traditions. For example, Buddhist beliefs about reincarnation and warnings against mutilation of the body have been used to explain Asians’ resistance toward organ transplantation. However, the prosperity of organ transplant programs in China despite scarcity of brain dead donors suggest that a society’s resistance toward brain death does not necessarily correlate with its aversion to transplant or removal of organs. Does the concept of brain death itself evoke an unsettling sense of violation?

East

Eastern philosophy takes a more amalgamated view on life. The dichotomy between body and soul is a foreign concept to Asian societies. One scholar noted: “Despite

four decades of modernization, it is difficult to imagine that beliefs about death that have been so central to Japanese culture for the past several thousand years would vanish, even in the face of high technology medicine.” (Feldman 1988, 342) In Shintoism and Taoism, the native beliefs of Japan and China respectively, it is not only difficult to separate the mind from the body, human life is also intimately associated with the surrounding environment (Kasai 2009; Liao 2005). Shintoism understands humans within the context of the forest, coexisting with mountains, rivers, sun, earth, plants, and animals (Kasai 2009). Taoism also advocates accepting and following the laws of nature, albeit often mysterious. Confucianism classifies longevity and natural death among the “five principles of happiness,” while violent or premature death and sickness are counted as “extreme ferocities” (Liao 2005, 69). In this cosmos, the physical and spiritual mingle, the boundary between life and death is blurred and often impossible to discern (Feldman 1988; Liao 2005; Kasai 2009). Death represents an ambiguous and gradual process with disintegration of both the physical and spiritual existences, accompanied by rituals of leave-taking and seeing-off. From the perspective of the nature worshiper, brain death is too specific and artificial (Feldman 1988; Kasai 2009). In a Japanese documentary, the wife of a man who is presumed brain dead from an intracranial hemorrhage complained of feeling uncomfortable with designating the time of death as at the end of the second brain death exam. She refused the brain death exam in order to “see him off in a natural way” (Yanagida 2012).

Beliefs about the importance of the physical body in the afterlife pervade Eastern religions. The body is a gift from one’s parents and ancestors who can be traced to the mythological era (Ohnuki-Tierney et al. 1994). Annihilation of the body’s wholeness represents disrespect for the parents and desecration toward the ancestors, therefore a premier violation of the “filial duty” (Tang, Li, and Wu 2008; Chang 2003). Not being buried whole is considered a curse to be dodged and one of the most severe punishments for one’s enemy (Feldman 1988). An intact body is required for the spirit to transition upon death, to enjoy life in the underworld that resembles the current one in every way from bribery to bureaucracy, and to reincarnate into the next life (Yu and Xing 2009). Although not direct criticisms of brain death, these beliefs are thought to contribute to the rejection of brain death in Eastern societies because of

the intimate relationship between brain death and organ procurement in medical practice.

The brain does not occupy a special position as the dominant organ. Traditional Chinese Medicine teaches that the human body is a system of correspondence, rather than a system of causation (Ohnuki-Tierney et al. 1994). Functions of living result from interactions between 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 (Bowman and Richard 2003; Keown 2010). Even in the absence of measurable brain activity, consciousness may still be dwelling in the body (Bresnahan and Mahler 2010; Keown 2010).

For Asians, the definition of life reaches beyond rationality. Takeshi Umehara, a prominent polytheist, criticized the rationale of brain death as “lacking the sense of awe toward life” (Kasai 2009, 36). To label physical existence without consciousness and thoughts as mere matter disregards the fact that insects and plants are also alive. This suggests a world of total human control, contradictory to nature worship. Buddhism identifies three crucial elements for life—vitality, heat, and sentiency (Bresnahan and Mahler 2010; Keown 2010). Vitality is the energy and driving force of life. Vitality generates work, represented by body heat. Sentiency means the way in which consciousness perceives and interacts with the surrounding world. It is in no way limited to the sensory arm of the nervous system and does not warrant existence of the brain. Zhu Xi, a Confucian scholar of the Song Dynasty, also noted that “[w]hen a person is about to die, heat leaves his body, which indicates that the spirit is gone” (Liao 2005, 70). The importance of body heat as a sign of life makes brain death unacceptable. Several scholars have reached the conclusion that, for Asians, “the inactive brain represented a prolongation of life rather than, as it has come to be viewed in Western countries, a prolongation of the process of dying” (Ohnuki-Tierney et al. 1994). When looking at a warm body with a beating heart on mechanical ventilation, Asians do not see a collection of cadaveric organs being perfused, but “the co-habitual relationship between the body and the spirit and integration of life being supported” (Kasai 2009, 39). Family members frequently quote heartbeat and body heat as tangible evidence that the brain dead patient is still alive (Hong 2007; Yu et al. 2012; Gao 2012).

In addition, unlike the Western portrayal of an autonomous self enclosed inside the brain, personhood in the

East is constituted in the public domain through a web of interpersonal relationships and exchanges (Lock 2002). Confucians define the meaning of human life through a series of obligations. Filial duty has been mentioned often as an obstacle to popular acceptance of the brain death criteria in China (Ouyang 2004). The dying ought not die for themselves, but are required to keep on living to comfort the survivors. The ostensibly lifelike body with mechanically maintained vital signs represents a lingering hope that helps uphold the social connections surrounding the brain dead patient. For the survivors, accepting brain death would mean relinquishing one's obligations. The principle of *zhongsheng* advocated by both Taoism and Confucianism emphasizes making a rigorous effort toward continuation of both physical and social life (Liao 2005). People's understanding of organ donation also reflects this desire to cling to a physical existence that sustains social connections. Whereas organ donation is a gift of life benefitting the recipient in the West (Quiroga 2011), it serves as an extension of the donor's life to families who agree to donate in the East (Zhan 2012).

In contrast to the West, none of the authority figures for the Eastern religions has announced a clear opinion for or against brain death. This lack of clear religious guidance impedes further the acceptance of the brain death standard.

Conclusion and Outlook for Future Research

Existing discussions on the differences in attitudes toward brain death between East and West have focused on cultural heritages. In summary, neuro-essentialism and elevation of rationality and autonomy as the defining characteristics of personhood nurture the concept of brain death and its widespread acceptance in the West. Obscure boundaries between an individual human life and the rest of the universe, as well as interpreting the preserved vital signs as being alive, hinder the utility of brain death in the East. Overall, philosophical and religious backgrounds appear to reflect the degree of ease or difficulty with which societies have adapted to brain death.

However, little is known about the application of these ideological disparities in real life. Ordinary individuals may not explicitly express the concepts mentioned above by medical anthropologists, and perhaps cultural influences may be subtle and not consciously acknowledged. High-stakes medical decision-making by typical

individuals, especially regarding controversial issues, is often intuitive. In a survey of American families who did not consent to donate the organs of their brain dead relatives, less than 2 percent cited either religion or culture as the reason for their refusal, and 80 percent disclosed emotion as the deciding factor (Ojo et al. 2004). In a Chinese study, the possession or lack of religious faith did not correlate with respondents' approval of the brain death standard (Yu and Xing 2009). For families who refuse to accept, or physicians who refuse to make, a brain death diagnosis, emotional or intuitive states may play a crucial role. These emotions may include disbelief, guilt, helplessness, anger, and pain, as found in a study of families coping with ICU death (Townsend 1995). What types of emotions are provoked by brain death and how people's emotional responses differ or resemble each other in East and West are unknown.

Moreover, the philosophical arguments are not always unique to any one culture, although they may represent mainstream thinking. We acknowledge that variations exist within the larger cultural frameworks we refer to as East and West; certain subpopulations may show reasoning patterns resembling their counterparts in the contrasting culture. Advocates for legalization of brain death around the world recognize its utility

in organ transplantation and conservation of medical resources. Procurement and donor registry organizations in both Eastern and Western countries use "the gift of love" as their slogan of choice. Interviews with Swedish families of the brain dead revealed that Westerners also conjure a living person in the warm body with a beating heart and an undulating chest, although the images eventually change into that of an empty shell (Frid et al. 2007). Instead of a contrasting list of concepts as presented in Table 3, Easterners and Westerners may take into consideration a similar set of principles when faced with the dilemma of brain death, but assign them different priorities to guide their decisions (Haidt 2007).

Lastly, social circumstances unique to the modern era, unforeseen by Socrates or Confucius, likely make a significant contribution to how people perceive brain death. One example, trust in the health care system, has been explored to explain the cautious approach to brain death in Japan (Lock 2002). Escalating physician–patient conflicts in China in recent years (Bai 2012; Hu, Zhang, and Zhang 2012) may contribute to the disbelief of patients' families in the diagnosis of brain death. The information gap between physician and patient certainly invites misunderstanding. Care providers may then avoid broaching subjects such as brain death to prevent

Table 4 Timeline of the main events in neuroscience, critical care medicine, and transplant surgery that led to conceptualization of brain death

	Neuroscience	Critical care	Transplant
1890	ICP increase associated with respiratory arrest preceding circulatory arrest		
1900			Vascular anastomosis
1910			
1920	EEG	Iron lung	
1930	Cerebral angiograms	Invasive monitoring	Unsuccessful kidney transplant attempts using unrelated donors
1940			
		Positive pressure ventilation in response to European polio epidemic	
1950	Coma dépassé: state of irreversible coma and apnea	ICU built in hospitals Mechanical ventilation	Successful kidney transplant between identical twins Immunosuppressive therapy
1960	Proposals to equate death of the nervous system to cardiopulmonary death Sydney conference Harvard criteria		Liver, lung, pancreas transplants First transplant from a heart-beating donor
1970	Brain stem death criteria		
1980	Universal Declaration of Death Act		

retaliation from patients. The contemporary social climate may further eclipse the influence of philosophical and religious traditions on medical decision-making (Table 4).

Addressing some of these hypotheses can help elucidate the root cause of differences in attitudes toward brain death in East and West. By understanding what obstacles lie in the journey of brain death from academia to real-life settings, future research should aim to inform policy-makers in countries where brain death remains controversial, such as China. For example, if research reveals that Chinese citizens firmly believe that vitality and body heat represent life, and therefore are unlikely to see the brain dead as truly dead, legalizing brain death may evoke popular rage. However, if it shows that education and economic status significantly correlate with acceptance of brain death, propagating factual knowledge about brain death through the media or giving financial incentives may facilitate execution of the brain death law. In addition, by bringing attention to the cultural context, we hope to empower medical providers to communicate about brain death to diverse patient populations with more clarity and empathy. At the institutional level, hospitals are able to consider places of potential conflict and mitigation strategies when implementing protocols for ventilation withdrawal or organ donation upon brain death. At the individual level, the providers who are aware of the discrepancies in value prioritization between themselves and their patients are better prepared to handle family reactions upon hearing the verdict of brain death.

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