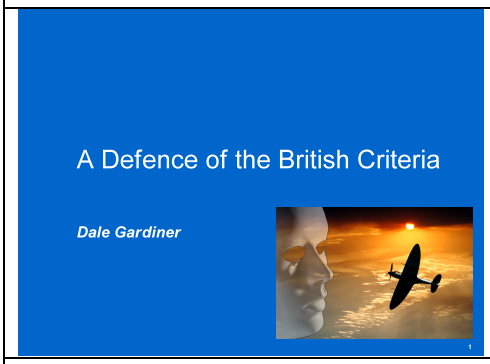
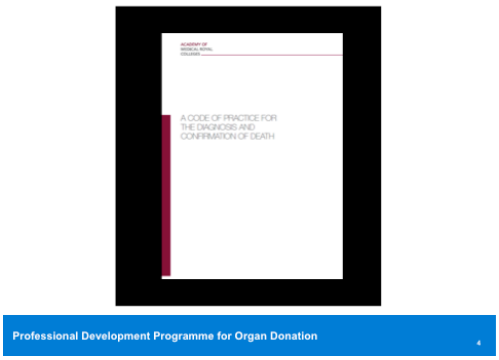
PDP: Diagnosing Death
A Defence of the British Criteria



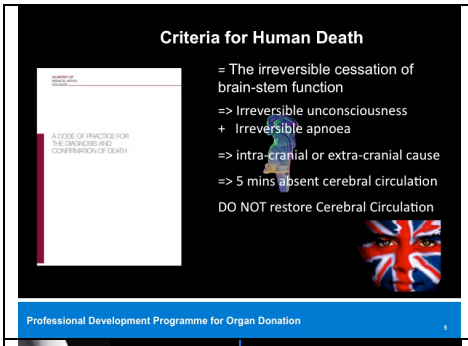
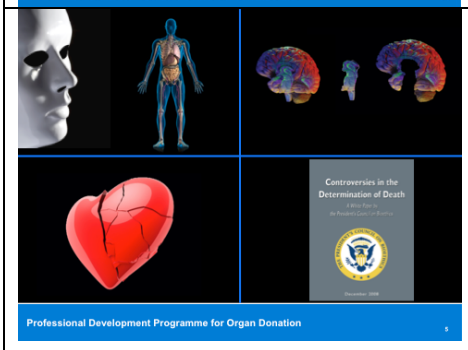
This may seem an odd place to begin a session on Diagnosing Death. With a defence.

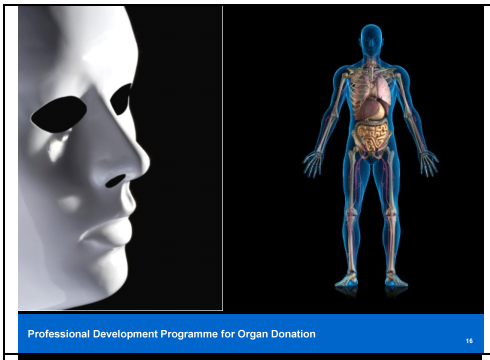
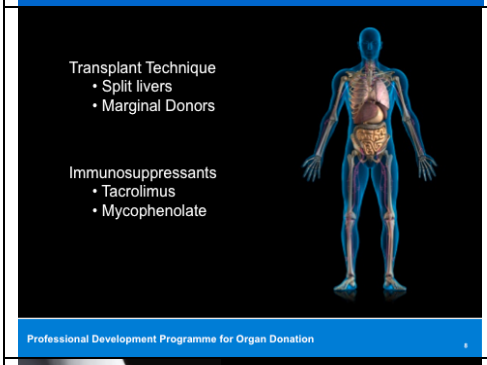
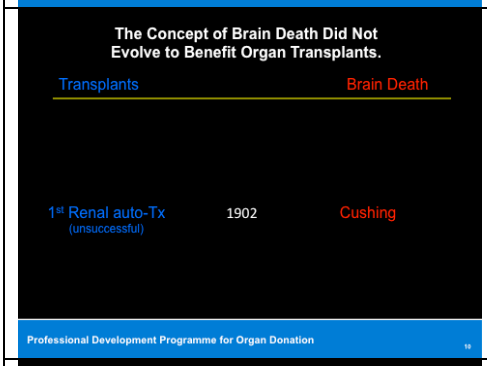
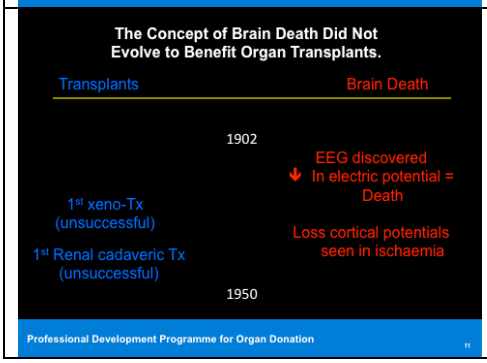
After all we are 30 years on with brain stem death criteria in the UK, with general medical, societal and legal acceptance. We who work in intensive care are good at diagnosing death and our specificity is as close to 100% as good as anything that can be done in medicine. Yet still, even after all this time, if you read the literature or give a lecture to a wide audience or even chat in your coffee room you will discover those who hold criticisms and concerns.

We felt to present Diagnosing Death to you today, yet ignore critics such as these, would be to inadequately prepare ourselves and you for dealing with these criticisms when you read about them or are questioned regarding them by colleagues, nursing staff, relatives. Because we want you to confidently understand the criteria for diagnosing death…

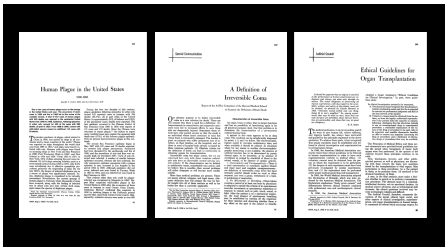


as outlined in this document. So this first lecture starts the day by looking at Diagnosing Death from the perspective of some important and legitimate questions that have been raised in response to these criteria and its predecessors. Predecessors that stretch back, almost unchanged, since 1975.

	**But first what do I mean by the British Criteria. What are the criteria we use to diagnose human death in the UK?**
	**There is no way I can cover all the debate regarding diagnosing death, but I have provided an extensive reference list in your packs. What I have chosen to do is outline 4 important discussions, for us to briefly consider. Firstly** **1. Is brain death just an artificial construct to allow organ donation?** **2. We in the UK talk about brain stem death, the rest of the world uses whole brain death and philosophers and transplant surgeons use the term higher brain – Is this difference in language and concept relevant to us and our understanding of brain stem death in the UK?** **3. In 2008 the US Presidential Council on Bioethics investigating controversies in determining death explored all the justifications that can be used to define brain death as human death. This Presidential council by majority decision of its committee proposed a new more robust justification. What were the justifications for brain death being human death they rejected, what was their new one?** **4. And finally I wish to touch on diagnosing cardiac death for NHBD, for which I have been a published critic. Why am I now satisfied with the Academy's 5 minute recommendation?**

		So let's begin. Is brain death just an artificial construct to allow organ donation. This is a common criticism that pervades much of the literature and much conversation around the coffee room. I think we can be very confident that this is not the case.
		Improved Transplant surgical techniques, immunosuppressive agents – yes they evolved to benefit transplantation.
		But the concept of brain death was well progressed before organ donation and transplantation became a reality. Let me illustrate.
		In 1902 Harvey Cushing described patients with raised intracranial pressure where permanent cessation of respiration preceding that of the heart.
		In the following decades the EEG was discovered and it was proposed that a reduction in electrical brain potential might signify death. This was backed up by EEG observations showing that a loss of cortical electrical potential was seen in cerebral ischemia.

The Concept of Brain Death Did Not Evolve to Benefit Organ Transplants. Transplants — Brain Death 1st successful live Renal Tx 1950 Cessation of brain blood flow = Death Cortical circulatory arrest seen in coma patients 1960 Death of the nervous system = Coma dépassé Professional Development Programme for Organ Donation 12	At the beginning of the 1950s it was proposed that the cessation of brain blood flow equated to human death. With the advent of mechanical ventilation it was possible to identify coma patients where cortical circulatory arrest had occurred.
"Le coma dépassé" Mollaret & Goulon *Rev Neurol* 1959, **101**:3-15 • apnoeic coma • brainstem areflexia • poikilothermia • DI • haemodynamic instability • inevitable asystole  REVUE NEUROLOGIQUE MÉMOIRES ORIGINAUX LE COMA DÉPASSÉ Professional Development Programme for Organ Donation 24	This paved the way to 1959 where the death of the nervous system or coma dépassé was described.
The Concept of Brain Death Did Not Evolve to Benefit Organ Transplants. Transplants — Brain Death 1960 1st successful cadaveric Renal Tx Irreversible cessation of the EEG = Death Professional Development Programme for Organ Donation 13	Following from this and other international observational research it was proposed that the irreversible cessation of the EEG was human death.
The Concept of Brain Death Did Not Evolve to Benefit Organ Transplants. Transplants — Brain Death 1967-68 1st successful Heart Tx Harvard Criteria Brain Death = DEATH Professional Development Programme for Organ Donation 14	Then in 1967 and 68 the margins between transplantation and the concept of brain death became blurred.
 3rd December 1967 Professional Development Programme for Organ Donation 17	In 1967 Christian Barnard carried out the first heart transplant in Cape Town. Incidentally this was a NHBD donation as Barnard felt that even though he had been given legal assurance brain death would be okay to use in South Africa he decided to play it safe and await asystole first.

Ad Hoc Committee of the Harvard Medical School JAMA *5th Aug 1968*  A Definition of Irreversible Coma Professional Development Programme for Organ Donation 18	**And within 9 months we had the Ad Hoc Committee of the Harvard Medical School publish their landmark paper establishing human death as brain death.**
 Human Plague in the United States A Definition of Irreversible Coma Ethical Guidelines for Organ Transplantation Professional Development Programme for Organ Donation 19	**Nestled somewhat unfortunately between an article on human plague in the United States and an American Medical Judicial Council Report on the Ethical Guidelines for Organ Transplantation.**
'Our Primary purpose is to define irreversible coma as a new criterion for death… …Obsolete criteria for the definition of death can lead to controversy in obtaining organs for transplantation.'  A Definition of Irreversible Coma Professional Development Programme for Organ Donation 20	**Even the Ad Hoc Committee's first paragraph gives as one of it's justifications for redefining death, 'Obsolete criteria for the definition of death can lead to controversy in obtaining organs for transplantation.'** **So is it any wonder people doubt the independence of brain death.**
The Concept of Brain Death Did Not Evolve to Benefit Organ Transplants. Transplants — Brain Death *Future* *1st xeno Tx* *1st lab grown organ Tx* *Brain Death = DEATH* Professional Development Programme for Organ Donation 19	**But what of the future. When we have the first xeno-Tx or the first Tx from a lab grown organ. What then will happen to the concept of brain death? I think the concept of brain death will still be with us.**
 Professional Development Programme for Organ Donation 23	**Although organ donation and diagnosing death are closely aligned at present, in the future our day job might have nothing to do with organ donation and there will be no such thing as Clinical Leads for Organ Donation, but those of us in intensive care, will still have to diagnose death and brain stem death.**

Professional Development Programme for Organ Donation 24

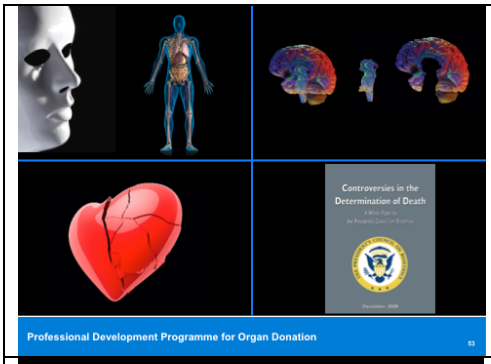
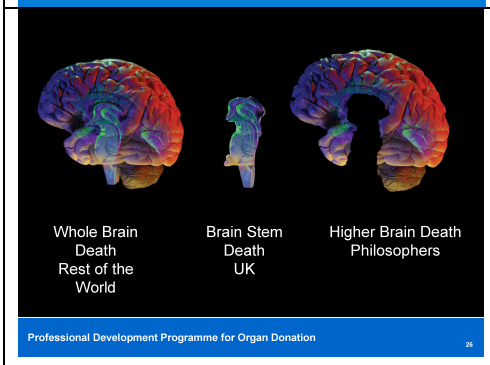
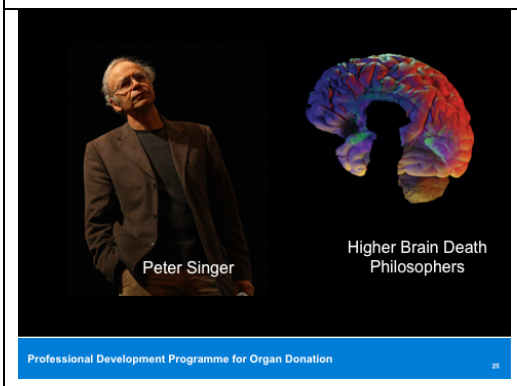
It is however very wise and appropriate that Alex and his co-authors deliberately removed all references from the Code of Practice to transplantation beginning this process of re-separating diagnosing death from transplantation.

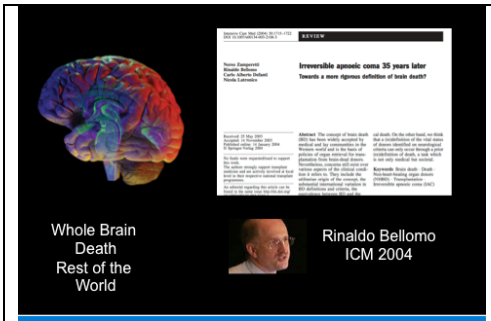
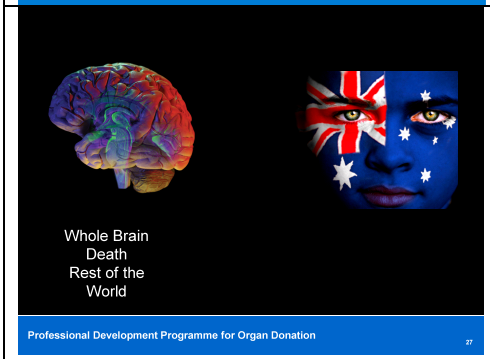
diagnosis decision

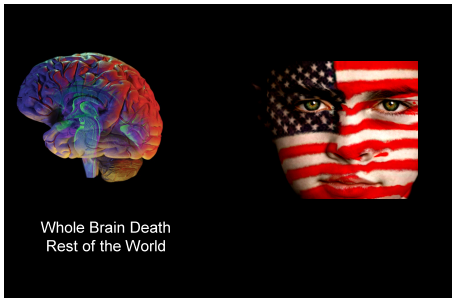
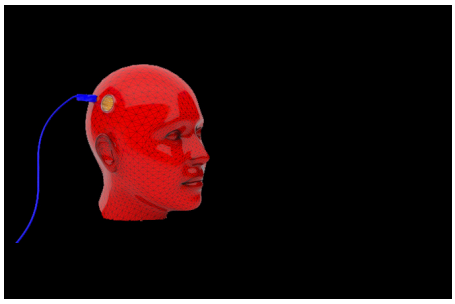
Professional Development Programme for Organ Donation 25

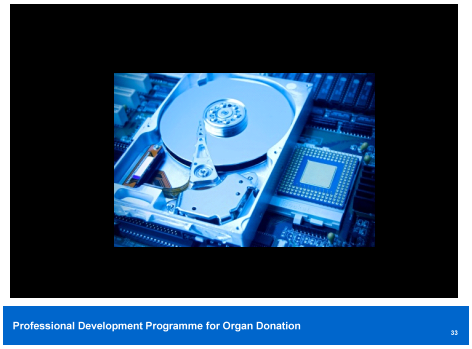
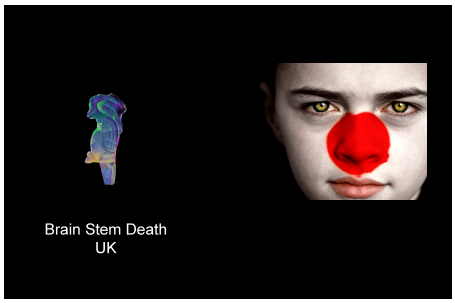
One question is often asked - why do we need to diagnose brain stem death when we are going to withdraw anyway? Especially now when NHBD is an option for patient's and their families. I think there is a difference between a diagnosis of death and a withdrawal of life sustaining treatment decision. A diagnosis of death, when carried out appropriately as we will hear today, carries a 100% specificity and the certainty this gives families and ourselves as clinicians should not be under-estimated. A withdrawal decision remains a decision and you may not find 100% of your colleagues agreeing with your decision.

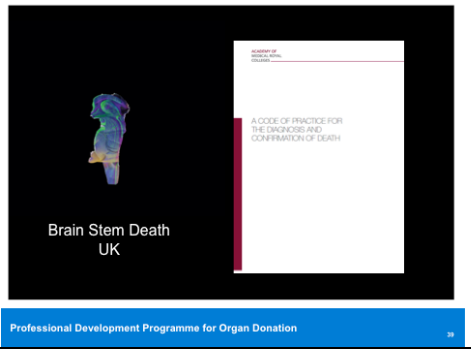
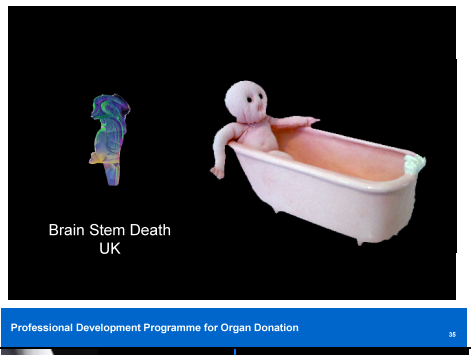
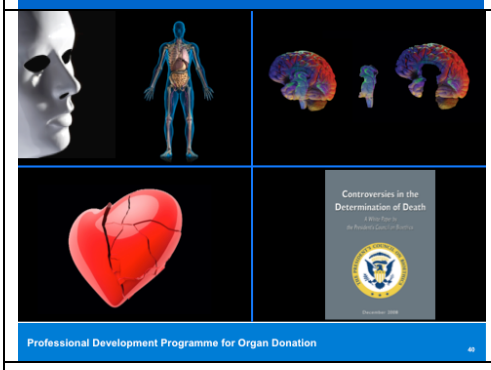
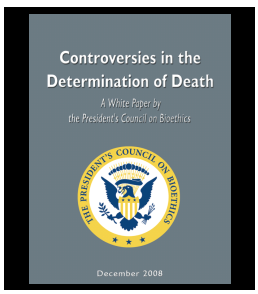
I think we should support the Taskforce's recommendation that brain stem testing be carried out whenever possible, not just to facilitate heart beating donation, but because a diagnosis is ethically and scientifically better grounded than a decision. Does that mean you should wait three days for brain stem death – no – the need for certainty should always be a balanced decision – but whenever possible we should endeavour to carry out brain stem testing. And we should encourage our colleagues to do so.

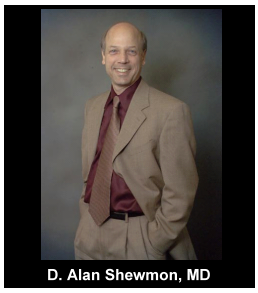
	**Moving on…**
	**We define death as the irreversible cessation of the brain stem. The rest of the world requires the demonstration of whole brain death or death of the whole brain. Whilst some philosophers and transplant surgeons talk of higher brain definitions of death opening the way for donation from PVS patients and anencephalic children. How relevant should this difference in language and concept be for us here today?**
	**This is Peter Singer a famous utilitarian philosopher. I am going to tell you about him so that you can get a feel for how crazy some of these arguments can get.** **He starts strongly: How can brain death equate to human death because death is universal for all living things and not every creature has a brain.** **Then he goes radical: a person who is severely brain damaged may not be dead but that person no longer has the same rights as you and me so perhaps we could still take their organs.** **Indeed Peter Singer sees nothing wrong in taking organs from those in PVS or anencephalic children, and has been quoted as saying that some animals have greater qualities of personhood than some brain damaged humans. I am not even going to touch this one.**

	**Most other critics would not go as far as Peter Singer but their motivation to align themselves with people like Singer should be examined carefully. The editorial accompanying this article by Bellomo and colleagues published in Intensive Care Medicine 2004 picked up his point and hinted that the desire of the authors was to increase the donor pool by radically changing our current concept of death and the dead donor rule. What Bellamo et al argue is that even if brain death isn't death, society may still feel it appropriate that these terribly brain damaged individuals can have their organs removed provided there is prior consent from themselves or from their relatives. This would open the way for organ donation not only from PVS and anencephalic children, but also heart beating donation from those we normally consider only for non-heart beating donation.**
	**I think it's more important for us to consider today why we in the UK are confident to locate human death to one part of the brain – namely the brain stem. And not define it like other countries as death of the whole brain.**
	**This is not as huge a gulf as it might seem. The Australian & NZ statement of 2008 requires that brain death requires unresponsive coma, the absence of brain stem reflexes and the absence of respiratory centre function ie a clinical examination of the brain stem suffices provided the usual preconditions are satisfied.**

 Professional Development Programme for Organ Donation 28	The Canadians are very similar defining brain death as the clinical absence of brain function as defined by profound coma, apnea and the absence of brain stem reflexes. Ie a clinical examination of the brain stem suffices provided the usual preconditions are satisfied.
 Professional Development Programme for Organ Donation 29	It's only in the USA that many jurisdictions insist on absent EEG or some other form of ancillary testing to attempt to diagnose death of the whole brain.
 Professional Development Programme for Organ Donation 30	So why doesn't the rest of the world follow the British Criteria of brain stem death? Their stated concern is that you can have an isolated injury to the brain stem and no higher brain damage and be declared dead in the UK.
 Professional Development Programme for Organ Donation 31	Some claim there is theoretical evidence that other areas of the brain apart from the brain stem such as the thalamus and the palladium which may (using deep brain stimulation) be capable of causing arousal and acting as a surrogate reticular activating system.
  NEJM 2010 Professional Development Programme for Organ Donation 33	And with the recent reports of potential awareness in PVS shouldn't this make us concerned? No and no. PVS is not the same as brain stem death. These patients and those in minimal conscious states demonstrate arousal – an essential part of consciousness. Not only that but PVS has a 40% misdiagnosis rate by clinicians. We should be confident in the way we diagnose brain stem death and how we

	have done so for thirty years. There is no equivalent of a pace maker for the brain stem - some sort of artificial reticular activating system.
 Professional Development Programme for Organ Donation 33	In the end I like to think of the brain stem as my motherboard and my higher brain as my hard drive. Today in 2010 when your motherboard dies you die and there is no resuscitation possible and you do not wake up or breathe again. And no scientific case report or experimental study on brain stem dead individuals to date says that we should doubt this. Maybe in the future with deep brain stimulation probes or the ability to transfer your consciousness onto a USB memory stick we will need to reconsider our criteria for brain stem death – but not today.
 Professional Development Programme for Organ Donation 35	You see we have a job to do today in 2010. And that job is to diagnose the dead – not write science fiction.
 Professional Development Programme for Organ Donation 34	But don't we have a self-fulfilling prophecy – if we withdraw or proceed to organ donation every time we diagnose brain death how do we know they never wake up or breathe again. Well here I thank the Japanese and a few other nations for their failure to accept brain death criteria and their heroic attempts to support organ function in brain dead patients indefinitely. None wake up and none breathe again. That is as true today as it was thirty years ago.

	**We can be fully satisfied and confident in the UK with our British criteria.**
	**And there is certainly no need to throw the baby out with the bathwater.**
	**Moving to our third area.**
	**In 2008 the US Presidential Council on Bioethics investigating controversies in determining death explored all the justifications that can be used to define brain death as human death. This Presidential council by majority decision of its committee proposed a new more robust justification. What were the justifications for brain death being human death they rejected, what was their new one?**

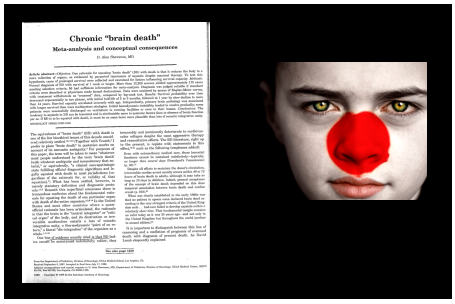


Professional Development Programme for Organ Donation 37

Well a large amount of their debate was heavily influenced by the poster boy of anti-brain death, Alan Shewmon and his detailed and scientific criticisms of the rationales used to justify brain death as human death.

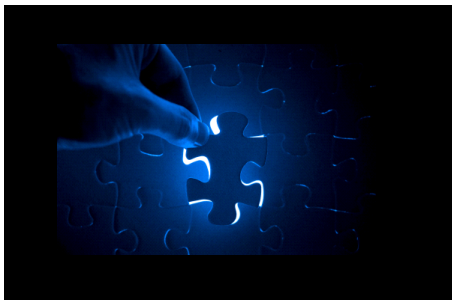
Professional Development Programme for Organ Donation 44

One of the earliest justifications for brain death being human death is the claim that cardiac asystole invariably occurred within 24- 48 hours. So that even if they weren't dead they soon will be. Suggesting that brain death is prognostic for true death.



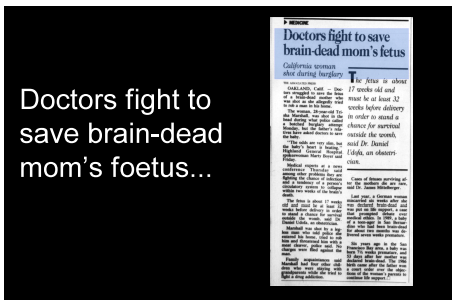
Professional Development Programme for Organ Donation 39

Shewmon in his 1998 landmark article, with help from our friends in Japan, have unequivocally demonstrated that somatic survival with good intensive care is probably possible indefinitely. Just by the edition of vasopressin one Japanese group increased time to asystole to two weeks.



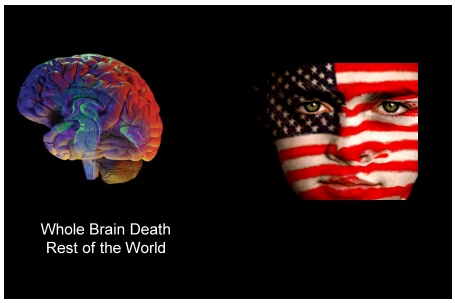
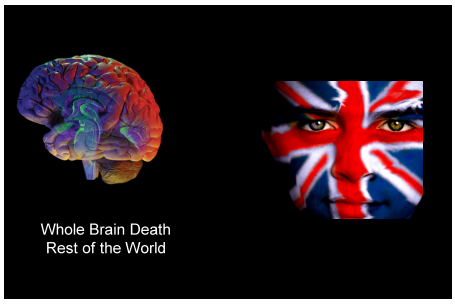
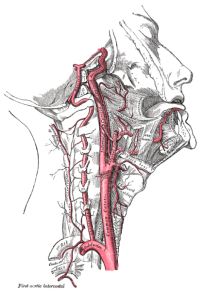
Professional Development Programme for Organ Donation 40

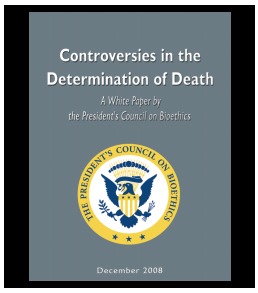
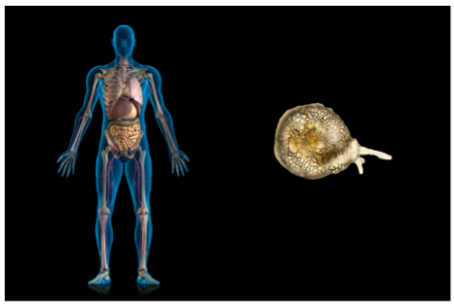
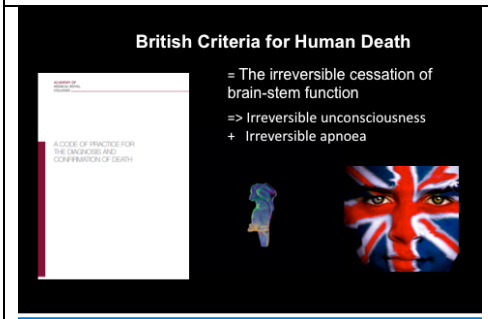
Likewise another justification for the concept of brain death is integration. It has been claimed that the brain is the integrator of the body and without it somatic function cannot be maintained. Shewmon aptly demonstrates the detailed integration of the body without the brainstem. One case can illustrate.

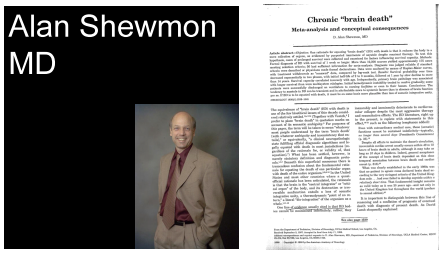


Professional Development Programme for Organ Donation 41

Trisha Marshall Shot in the head during an attempt at armed robbery. Declared brain dead two days later. Pregnant at the time of the robbery. Parents asked hospital to do anything in their power to allow the baby to be born. Had been brain dead for 3 1⁄2 months when giving birth to a healthy baby boy. **There certainly seems a**

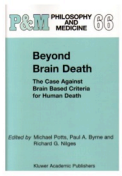
	remarkable amount of bodily somatic integration.
 Professional Development Programme for Organ Donation 42	**More debatable to the authors of the President's council was this. Not all patients declared brain dead developed diabetes insipidus demonstrating that not all functions of the brain had ceased.**
 Professional Development Programme for Organ Donation 43	**And you can see that with an insistence on whole brain death and loss of all functions of the brain this would be a special concern to them, wheras**
 Professional Development Programme for Organ Donation 44	**Preserved hypothalamic posterior pituitary function does nothing to invalidate our brain stem death criteria**
The inferior hypophysial artery is an artery supplying the pituitary gland. It is a branch of the cavernous carotid artery (internal carotid artery) which is extradural at this point.  Professional Development Programme for Organ Donation 45	**But as noted by the President's council the posterior pituitary receives extradurally supplied blood via the inferior hypophysial artery. So why the President's council didn't simply choose to define whole brain death as death of the whole brain as supplied by intradural circulation - I do not know.**

 Professional Development Programme for Organ Donation 46	**So what was their new justification for brain death equating to human death?**
 Professional Development Programme for Organ Donation 54	**What the President's Council did conclude, even if by a majority decision, is that a better justification for brain death equating to human death is that an organism whether it be a man or an amoeba must be open to the world – it must be able to both perceive the world around it and act upon it.**
 Professional Development Programme for Organ Donation 55	**For a human being therefore the President's Council concluded that consciousness, or the ability to perceive the world, combined with the drive to breathe, demonstrating the most basic way a human being can act upon the world; the loss of these two things equates to human death. So that human death equals irreversible unconsciousness and irreversible apnoea.**
 Professional Development Programme for Organ Donation 56	**Isn't this remarkably similar to the British criteria?**



Professional Development Programme for Organ Donation 47

And despite all of Alan Shewmon's painstaking work he has not been able to demonstrate a single case of resurrection or even a patient improving from brain dead to PVS after appropriately carried out diagnosis of brain death. No one wakes up no one breathes.



'Although we were unable to restore his consciousness or spontaneous breathing, the boy lived several more years.' (page 195)

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Even to the distressing point made in this book by one of the Japanese writers who writes very positively of a case where 'Although we were unable to restore his consciousness or spontaneous breathing, the boy lived several more years.'

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I reiterate - there is no need to throw the baby out with the bathwater.

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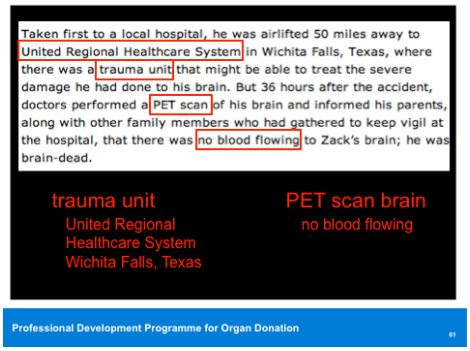
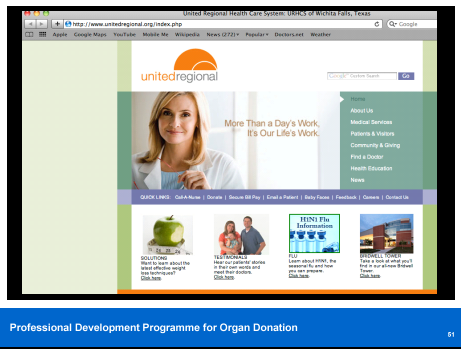
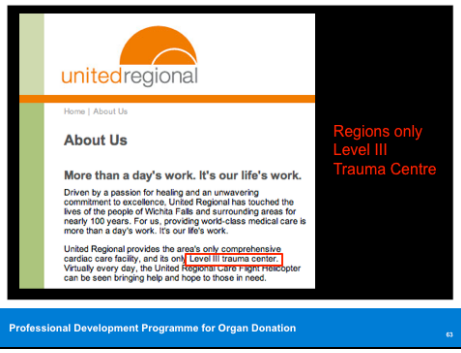
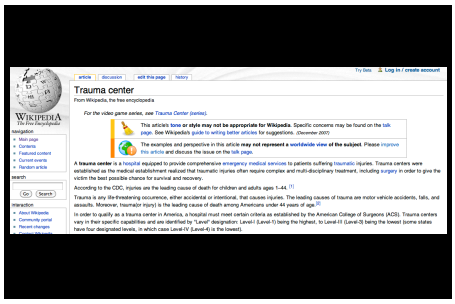
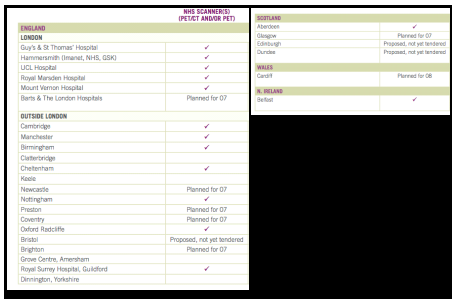
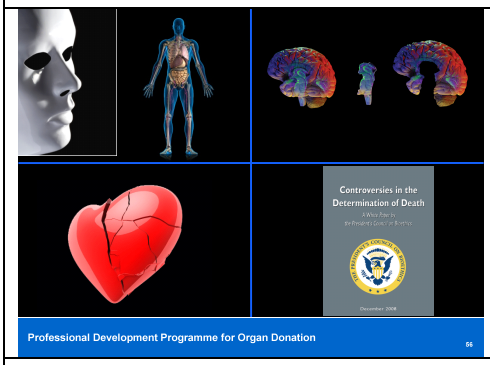
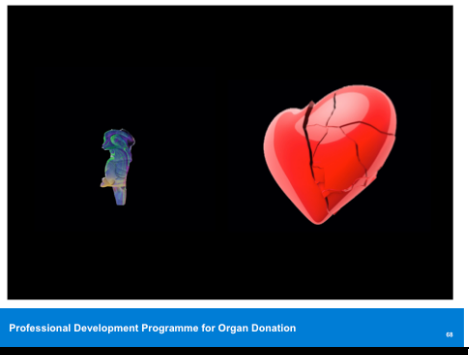
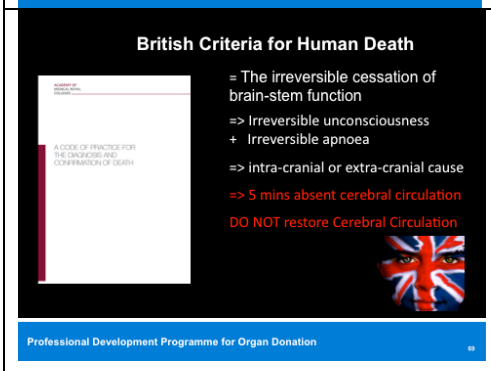
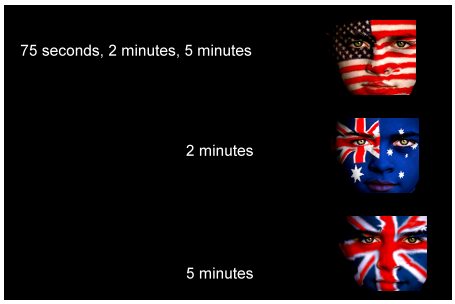
But what about Zack Dunlap in 2008. Declared brain dead by his doctor. The family consented to organ donation and it was while the transplant surgeons were flying by helicopter to the hospital to begin the retrieval he moved his arm to a stimulus. A spinal reflex obviously. But then he reached over to the other side when his nephew pinched his finger. That's not good!

	**So what care did Jack have. After his quad bike accident he was airlifted 50 miles away to the local trauma unit at the United Regional Healthcare System, Wichita Falls, Texas where doctors carried out a PET scan that demonstrated no blood flowing to Jack's brain so they declared him brain dead. Pretty damning?**
	**Except when you dig a bit deeper into the story and look up United Regional Healthcare System in Wichita Falls Texas**
	**You discover that they are the regions only Level III Trauma centre**
	**A quick look at Wikipedia confirms that Level IIi is the lowest level of trauma center. And they had a PET scanner which apparently if used incorrectly will not be able to detect brain blood flow.**
	**This is a table of UK PET scanners. I won't say these hospitals are the great and the good but they are some of the biggest. Would an equivalent of a Level IIi trauma centre in the UK have a PET scanner. Not very likely.**

	**This seems to me a clear example of this. We don't even know if they clinically examined Jack. And they certainly have not published a medical case report and there doesn't even appear there will be a legal suit since family and doctors have concluded Jack's remarkable recovery was an act of God**
	**I think we can feel confident in our British criteria and British expertise that such a cock up wouldn't happen here. Finally let us turn our attention to diagnosing cardiac death.**
	**or as the Academy code would have it diagnosing neurological death using cardiac-respiratory criteria.**
	**For the British Criteria state that it is reasonable to diagnose irreversible cessation of brain stem function after five minutes of absent cerebral circulation provided we don't do anything to restore cerebral circulation.** **No less than diagnosing brain death diagnosing cardiac death has been controversial. Partly because NHBD is new and partly because the time frames involved in diagnosing death are very tight and push the boundaries between life and death.**



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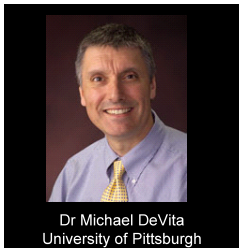
Around the world there is great variation in practice: 75 seconds, 2 minutes, 5 mins;


Dr Michael DeVita
University of Pittsburgh


The death watch: certifying death using cardiac criteria

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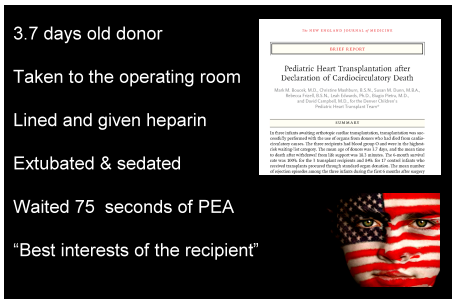
Most of the work for these numbers comes from Michael Devita and this influential paper 'The Death Watch'. It is in this paper that 65 seconds is proposed as the shortest acceptable observation time for the determination of death as this is said to be the longest duration of absent cardiopulmonary function when spontaneous recovery of circulation is possible.



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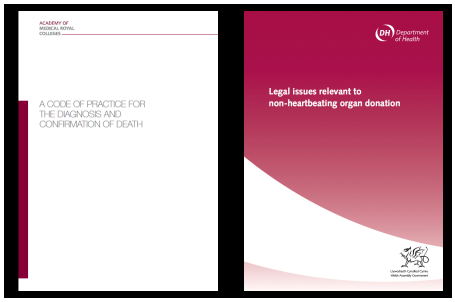
And on this basis the surgeons in Denver as published in the NEJM August 2008 carry out the following… [Talk from slide] The fact that our friends in the USA are doing crazy things in this field with very short time frames for confirming cardiac death and even using ECMO which has been known to restart hearts and supply oxygenated blood with a pressure to patient brains who have been confirmed dead at two minutes of PEA – does not mean we will ever do the same!



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This and this forbid it.

The circulatory–respiratory determination of death in organ donation*

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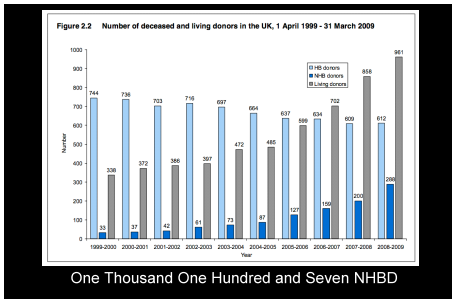
And the fiery debate sparked in the USA with the Denver publication and this just published special article featuring Michael Devita demonstrates a return to conservatism and sensibleness in our transatlantic neighbour. This paper is in your delegate pack and the message they gave was very clear: do nothing to re-establish cerebral circulation.



One Thousand One Hundred and Seven NHBD

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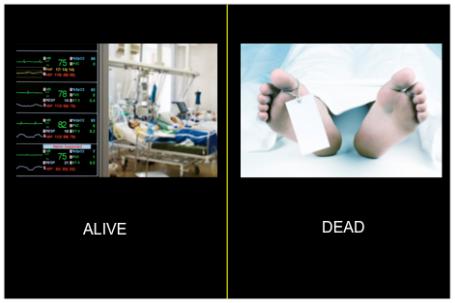
What I do know is there have been 1107 NHBD from this country with no reported or rumoured auto-resuscitation. Five minutes is conservative and safe.



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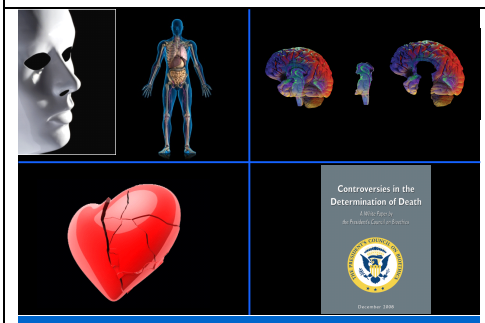
You see we have a job to do. To diagnose the dead – whether that be using brain stem criteria or circulatory criteria – in many ways what criteria we use is for us as clinicians to decide, and especially by those of us who are intensive care clinicians who work with life at the threshold of death. And generally society is happy for us to do so provided we do it very well - in fact 100% perfection is the minimum expectation by society. What we call dead must stay dead. And we are good at what we do.



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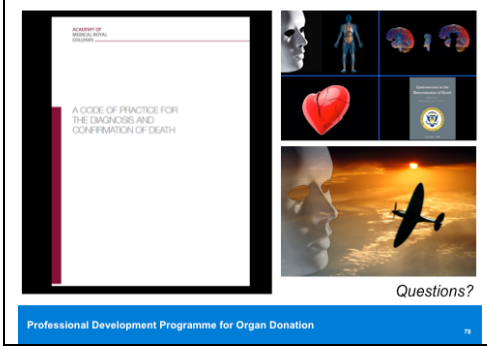
So as an overview in all these areas, it strikes me that the Academies guidance is supported by sound scientific and physiological rationales, is ethically substantial and satisfies all legal requirements.



For over thirty years now our British criteria has proven robust. What else in medicine can claim the same? It is practical, it will be durable into the future and it remains essential to intensive care. I am content, and I think we all should be content, to follow the Academies guidance.