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Nanotechnology — Benefits and Risks

Nanotechnology has some amazing possibilities. Scientists hope nanotechnology will be the technological saviour of the 21st century, making things smaller, faster, stronger, cheaper and more powerful than ever before. But it has a dark side, too.

Definition

Operating at around one-billionth of a metre, nanotechnology is science and engineering at the scale of atoms and molecules. This technology utilises materials, devices and systems that exploit 'novel properties arising from the structure and function of matter in the nanometre range.'[1] Using atoms such as carbon or silicon, nanotechnology can build totally new molecular configurations, conferring amazing properties to the resulting product. Where nanotechnology is fundamentally different from other technologies is that it builds from the bottom up, somewhat akin to nature. Even microtechnology, such as computer engineering, designs from the top down. The central tenet underlying nanotechnology is at once both disturbing and beguiling--that if you can control and rearrange atoms, you can literally create anything.

Background

Identified as a key area of scientific advancement, nanotechnology is one of CSIRO's five emerging science initiatives-- priorities that are closely aligned with Australia's National Research Priorities. Worldwide, more than US$8.6 billion was invested in nanotech research in 2004, with the US government projecting $1 trillion in sales by 2015. If this sounds rather far-fetched, consider the following: academic institutions worldwide (including Flinders University) are launching nanotechnology-specific curricula, over a third of the companies listed in the Dow Jones Industrial Average mention nanotechnology on their website, and newspaper articles focussing on nanotechnology have surged, from 200 in 1995 to over 8,000 in 2004. 'If you go back to the end of the 1980s, virtually every Nobel Laureate in Chemistry and Physics has actually been working at the nano scale,' said Mooney, CEO of the Etcetera Group, which charts technological change. 'A decade ago, there were only one or two patents being granted per year that remotely touched upon nanotechnology. Now we're up to thousands of patents per year, and growing exponentially.'[2] Among many others, he is arguing that nanotechnology won't just change jobs but whole economies; and the impact will be felt in all areas. In short, nanotechnology is taking the world of biotechnology and science by storm.

State of the art—context in healthcare

Over the past five decades, scientists have learnt to understand the basic principles and details of how nature works in the nanotechnological range. Mechanistic understanding of biological systems has progressed rapidly from the structure of DNA through to the genome sequence of mankind. Some of the most important molecular machines of our cells have become well understood, raising the possibility of nanobiotechnological interventions. Indeed, many commentators believe the biggest impact of forthcoming nanotechnology applications will be in healthcare through molecular manufacturing.[3] Disease typically arises from malfunctioning at the cellular scale. 'Treating cells with a scalpel is like fixing a computer chip with an axe, and treating them with drugs that invade the whole

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body is like immersing a computer in a bath to clean up one chip.'[4] It is becoming evident that nanotechnology could well revolutionise current interventions.

Diagnostic tools The rapidly developing field of diagnostics is utilising various technologies, including computing, advanced materials and nanotechnology. It is now possible to place millions of DNA molecules on chips, where they can be read by combinations of advanced optics and electronics. The technology makes use of proteins, termed receptors, which bind very specifically to molecules. If a molecule binds to the protein then a message is sent to a support matrix which signals that the molecule is present. The technology actually mimics the processes that nature uses to detect various molecules in the body, such as that seen in the immune system. Early diagnosis of diseases of the cardiovascular system including hypertension, some cancers and disorders of the central nervous system are likely to be areas where this technology could be applied.

Australian scientists have developed a nanotech biosensor that illustrates this potential well. The AMBRI Switch acts like a biological switch and is capable of detecting a whole range of substances from hormones to bacteria in any body fluid. It could provide blood test results in minutes rather than days. The scale of its working components are astounding and can be compared to a grain of sand relative to the world's oceans. Through a collaboration with Dow Corning (US), the AMBRI biosensor is being trialled at three Sydney hospitals.[5] It is one of the world's first true nanobiotechnology devices. If successful, and preliminary results are positive, the most probable route to broader implementation will be through large pathology services, which are beginning to invest in this area 'as the number of validated tests expands, the databases and on-line services which support their interpretation improve, and patient and doctor awareness of them increases.'[6]

Drug delivery and therapeutics. Because of their size, nanoscale assemblies offer unique opportunities in drug delivery and in therapeutics. Early 'cosmeceutical' products have included liposomes (fat-based vesicles) commonly used in topical lotions and titanium nanoparticles used in sunscreen produced by companies such as L'Oréal.

Over the last decade, liposomes have been under development as delivery vehicles. They have low toxicity, are versatile in size, composition and are capable of displaying drugs on their surface or encapsulating them within. Dendrimers are one type of nanoparticle that can be synthesised in such a way as to allow the attachment of drugs or other molecules of interest. Companies such as Dendritic Nanotechnologies and Alnis Biosciences are already marketing dendrimers for use in research.[7] Furthermore, the first dendrimer drug, developed by StarPharma (Melbourne, Australia) for use against HIV, received regulatory approval for phase 1 clinical trials from the FDA (US). The topical gel contains a nanoparticle thought to interfere with the entry and fusion process of the HIV particle.[8]

In another example of clinical nanotechnology, scientists in Singapore announced that cancer killing injectable chips based on nanotechnology had been trialled at Singapore Hospital. The Perth-based company pSivida, which developed the chips, says five out of eight liver cancer patients saw their tumours shrink by up to 60%.[9]

Further applications The emerging field of Regenerative Medicine may also utilise nanotechnology. Professor Matt Trau, from the Centre for Nanotechnology and Biomaterials at the University of Queensland, is head of a team of scientists working on new nanoscale materials for regrowing bones.[10] Another application of nanotechnology in healthcare could be post-surgery pain treatment. It should soon become possible to implant a drug release chip, together with an artificial hip for instance, which could administer analgesics in a localised way and over a time scale of months. Diabetics could also benefit from devices that combine insulin sensors and dispensers. As this disease is common, and the insulin supply from injections is never optimal, the demand for such a device would be astronomical. These examples are only a fraction of the healthcare applications proposed by those in nanotechnology.

Ethical appraisal

Safety

The need for an in-depth analysis of nanotechnology is reasonable, given previous concerns about transgenic organisms and the unpredicted environmental impact of materials such as asbestos and plastics. Issues relating to nanoparticle clearance and tolerance do need to be investigated—researchers, as well as the general public, will benefit from this information. The Royal Society (UK) and the CSIRO are among those who are studying possible developments in nanotechnology and whether they are likely to raise new ethical, health and safety, or social issues.[11] Given that the technology has such serious potential to do harm as well as good, many observers are concerned that nanotechnology presents a real threat both on microscopic and macroscopic levels.

The Royal Society has recommended that nanoparticles should be treated as new chemicals with separate safety tests and clear labelling. Greater care should also be taken with nanoparticles in labs and factories, and more research is needed into their effects on the environment, after a small number of studies showed that carbon nanoparticles caused brain damage in a species of fish. In 2002, researchers at Du Pont were surprised to find that carbon nanotubes, when injected into the lungs of rats,

caused 15% of them to rapidly asphyxiate.[12] They found that the particles had clumped together, with the cells responsible for clearing foreign particles unable to detect particles that small. Other research also raises troubling safety issues. It has been shown that nanoparticles in the nasal passage can be absorbed into the brain, changing shape as they go.[13] This fact is pertinent considering mad cow's disease (CJD) is caused by a change in a neural protein's configuration.

And what if nanotechnology was used to create destructive particles? It is entirely conceivable that technicians could synthesise something that, say, attacks the blood itself – irreversibly binding to haemoglobin molecules and preventing them from delivering oxygen throughout the body. What if terrorists sprayed such a dust into a crowd? This might seem more in the realm of science fiction but it is theoretically possible and a recent citizen's panel showed that the Australian public wants greater scrutiny of nanotechnology.[14]
Greenpeace has called for a moratorium on the release of nanoparticles: 'These materials should be considered hazardous until shown otherwise.'[15] Etcetera Group has urged for a moratorium on many kinds of nanotech research. They have also called for a withdrawal of new nanoproducts such as cosmetics. Furthermore, they are advocating for a UN conference to evaluate nanotechnology thoroughly.

Even the head of the CSIRO nanotechnology division has acknowledged there is little evidence on safety and that further research was needed. While there have been no major safety scares, neither has there been overwhelming evidence proving its benign nature. Dr Turrey, from the Center for Responsible Nanotechnology, believes that 'at the moment, I don't see how nanotechnology can be done responsibly without some kind of control on it.'[16] More disturbing, in a field of many thousands of citations per year, there have been no documented research on the risks of this technology until last year.[17] The problem, as with other technologies, is that the pace of development in nanotechnology is much quicker than that of wide–scale research into its impact, particularly studies assessing toxicity.

Privacy
There are also serious concerns that nanotechnology might cause further invasions of privacy and exacerbate the divide between rich and poor. Professor John Weckert, of Charles Sturt University's Centre for Applied Philosophy and Public Ethics, believes nanotechnology will impinge on privacy. Very fast computers and enhanced surveillance and new sensors will allow the collection, storage and access of vast amounts of information on people. While there will be benefits, 'the possibility is also opened for large-scale control of individuals, either by governments, employers or others with authority.'[18] This is worrying and safeguards ought to be in place to protect individual privacy. As new technologies become more powerful, stricter regulations are necessary for ethical implementation. This would not only maintain ethical conduct in healthcare, but give the public and healthcare professionals confidence in nanotechnology.

Broader concerns
There are other, more wide-ranging concerns which perhaps have more serious, if less tangible, implications. Philosopher and technology critic Jacques Ellul has argued that the rise of technology leads to the decline of traditional spirituality, as man transfers 'his sense of the sacred … to technique itself.' We develop a 'worship of the technique,'[19] and in doing so can easily forgo traditional religious beliefs. And such technologies are perfectly suited to arouse religious enthusiasm. After all, nanotechnology involves incredible, invisible powers.
Nanotechnology could be used for either therapy or enhancement. In the future we might be able to repair cells and fix damaged DNA; to remove toxins or cholesterol; to eliminate scar tissue, or even destroy cancer cells and fight countless diseases. But such technology could also be used for more dubious purposes. Take for example the 'respirocyte,' an artificial red blood cell. If it could be made to deliver oxygen hundreds of times more efficiently than real red blood cells, they would be invaluable in the treatment of various respiratory and cardiovascular disorders. But they could also be used to boost a mountain climber's endurance, to help a diver hold his breath for hours, or to enable a soldier to fight harder. And the respirocyte is among the simplest medical nanomachines imaginable. Nanotechnology is particularly attractive to those in the growing ranks of what Charles Rubin calls the extinctionists: 'the transhumanists, posthumanists, and others who seek to completely remake human nature. Nanotechnology is central to their vision of a future of agelessness, immortality, and rebirth.'[20]

Possible solutions

Although it is unclear when nanotechnology will be broadly introduced into mainstream society, few doubt its eventual implementation. Further, we tend to exaggerate the immediate impact of technological change whilst underestimating the long-term impact. 'The full importance of an epoch-making idea is often not perceived in the generation in which it was made.'[21] A recent co-director of CSIRO nanotechnology, says this provides an opportunity not to be missed: 'I think we have a unique moment in history to be a little bit smarter and look at some implications …before the full brunt of the technology is with us.'[22] Indeed, it would be unethical not to evaluate such a powerful technology thoroughly—from DDT to asbestos our society has paid an enormous price for failing to do this before industries develop.

In the US academic groups, such as the US Centre for Biological and Environmental Nanotechnology, have

been formed to address toxicology issues. In Australia, CSIRO has plans for a unit to look at the broader implications for society of nanotechnology research. Chris Phoenix, from the Center for Responsible Nanotechnology, believes we urgently need 'to see molecular nanotechnology policy developed and implemented with a care appropriate to its powerful and probably transformative nature.' Substancial government funding, whether from the State or Commonwealth, ought to be justified in terms of realistice returns and not speculative research. Furthermore, monitoring by relevant government departments could ensure safe and responsible nanotechnology research, both now and in the future.

We will also have to confront the 'extinctionist' challenge and in the longer term decide how far we should go. Nanotechnology raises many of the same ethical issues as biotechnology in general; how much should we tinker with our bodies? Are we trying to fundamentally remake ourselves? Finally, we may well be forced to rethink our place in the universe. Our new technological prowess could lead us to a deeper understanding of the human condition—or it could make us lose sight of God, and undermine our respect for nature and the world we live in.

ENDNOTES

[1] CSIRO www.csiro.au (accessed 30/6/2005)
[2] ECT Group. 'No Small Matter II: The Case for a Global Moratorium Size Matters!' http://www.etcgroup.org/documents/Occ.Paper_Nanosafety.pdf (accessed 25/6/2005)
[3] J Gross. 'The incredible shrinking technology.' *Financial Review* 02/1/2003
[4] A Keiper 'The Nanotechnology Revolution.' *The New Alantis Summer* 2003 www.thenewatlantis.com/archive/2/keiperprint.htm (accessed 07/4/2005)
[5] *ibid*
[6] CSIRO www.csiro.au (accessed 30/6/2005)
[7] L Mazzola 'Commercializing nanotechnology.' Nature Biotechnology 21 (2003) 1137-43 (2003)
[8] *ibid*
[9] Anon. 'News in Brief.' *Nature Reviews Drug Discovery 3* (2004) 819
[10] J Mattick 'The human genome and the future of medicine.' *MJA* 179 (2003) 212-216
[11] Sydney Morning Herald. 'Small science, big questions.' 17/11/2003
[12] B Feder 'Nanotechnology: as uses grow, tiny materials' safety is hard to pin down.' *New York Times* 3/11/2003
[13] *ibid*
[14] SMH 'Small science….' 17/11/2003
[15] *ibid*
[16] Center for Responsible Nanotechnology. www.crnano.org (accessed 28/6/2005)
[17] A Keiper, *The New Alantis Summer* 2003
[18] SMH 'Small science….' 17/11/2003
[19] J Ellul Excerpts from the *Technological Society*; http://jan.ucc.nau.edu/~jsa3/hum355/readings/ellul.htm accessed (28/6/05)
[20] C Rubin 'A Proper Role and Realistic Expectations for Science.' *Academic Questions*, 8/4 (1995) 24-33
[21] L Mazzola 'Commercializing nanotechnology.' *Nature Biotechnology* 21 (2003) 1137-43 (2003)
[22] Dr Vijoleta Braach-Maksvytis in SMH 'Small science….' 17/11/2003

Michael Herbert ✠

The Rural Urban Health Divide

Most of the Australian population is concentrated in urban areas and larger regional centres. There is a belief that living in rural areas is healthier than city living. However, the opposite is generally true. Contributing factors are lack of access to health care services, attitudes to health care, cost of basic amenities and the degree of remoteness.

Health differentials

The *Australian Institute of Health and Welfare* (AIHW) reports that in 2001, 66% of the population lived in major cities, 31% lived in inner and outer regional areas and 3% lived in remote areas. The recently released AIHW report *Rural, Regional and Remote Health* shows that non-urban Australians have shorter life expectancy, higher death rates, and are more likely to have a disability compared to city dwellers. Even when the effects of the known poorer health of Indigenous Australians are taken into account, people outside major cities are at higher risk of poor health because they are more likely to smoke, be overweight and drink excessive alcohol. They also have a higher rate of premature death from injury or accidents, higher mortality related to coronary artery disease, diabetes and asthma, higher incidence of infant mortality in remote areas, higher rates of suicides in men, and a consistently poorer cancer survival rate.[1]

The age-old divide between city and the country is suggested to be based on economic differences between the two cultures and the different perceptions between the two groups. Country people seek curative care when they are sick or injured, and do not seek preventative care to the same extent that their city counterparts do.[2] Even so, given that Australia provides and funds universal health care, these differentials should not exist. But all the data consistently shows that the health status of rural Australians declines with increasing distance from metropolitan and regional centres.

Unmet health care needs

In 1971 Tudor Hart suggested that 'the availability of good medical care tends to vary inversely with the need

of the population served'. He called this phenomenon, the Inverse Care Law.[3] More recently, the *Treatment Risk Paradox* was coined to describe when a treatment might be least likely to be used even though its use would probably have the most benefit.[4] This concept of a 'risk paradox' could be applied to preventive health care in rural and remote areas. For example, it is known that smoking rates are higher in these areas yet where preventive health care would most likely reduce risk factors for smoking related health conditions, there is less provision of such care.

Funding and access issues

Linked data from the *Medicare Benefits Schedule, the Pharmaceutical Benefits Scheme* and hospital morbidity data was used to study the differences in health status between living in urban and remote areas of Western Australia. People in remote areas accessed less Medicare funding but utilised more acute hospital care. The further people lived from service centres, the less it cost to government. However, the authors of this study acknowledged that Indigenous Australians did not use Medicare services to the same extent as other Australians.[5] There is no doubt that Indigenous Australians, especially those living in remote areas, do not enjoy the same health status as non-Indigenous Australians.[6]

People living outside capital cities have substantially lower private health insurance coverage than those living in capital cities; therefore, proportionally more Government expenditure is directed to capital cities than to rural and regional Australia, despite the greater health needs of the latter.[7] Even the *Department of Veteran Affairs* reports that rural areas are the least well served regions in comparison to urban and metropolitan areas.[8] Compared to their urban counterparts, rural youth express more concern about depression, suicide and teenage pregnancy, and cite disadvantage in accessing suitable health care due to a lack of bulk-billing providers and confidentiality concerns due to the limited number of providers.[9]

Scarce resources in rural and remote areas

Nearly half the rural population lives in an area which doesn't have enough doctors. The 30% of Australians who live in the bush only get 20% of Medicare rebates and are served by only 15% of the medical workforce.[10] There is not only a shortage of rural and remote health professionals but they also work longer hours than their urban peers.[11] Most of Australia is sparsely populated yet this isolation and remoteness from mainstream services does not mean people living in these areas are less deserving, yet they do seem somewhat disadvantaged when it comes to specialised and allied health care.

The *Australian Medical Workforce Advisory Committee* report, 'The General Practice Workforce in Australia', shows that in remote Australia there are only 93.6 GPs per 100,000 head of population in small rural centres in comparison to 122.7 per 100,000 in capital cities. In 1998 there was an identified shortfall of 1,240 GPs in rural and remote areas and an excess of approximately 2,300 GPs in metropolitan areas.[12] GPs are being offered pay deals of $300, 000 a year to work in the country. However, according to senior doctors in rural areas, some of the newer recently introduced Medicare payments have made city practices more profitable and reduced the incentive for doctors to shift to the bush.[13]

The *Senate 2002 Report on the Inquiry into Nursing* identified that attracting and retaining nurses in rural and remote areas is increasingly difficult. Reasons why experienced nurses do not choose to work outside metropolitan areas include the expense of moving, inadequate accommodation, lack of remuneration commensurate to qualifications and the degree of isolation or remoteness. Rural nurses leave nursing because of the workload, lack of recognition of their skills, poor educational opportunities and pressures of providing care that may be outside their scope of practice.[14]

Health is not just an absence of disease

The challenge to maintain a healthy lifestyle in remote areas is influenced by other factors which may be beyond the control of individuals living in these areas. Healthy food choices are not always available or can be too expensive, with prices, in remote areas, up to 19% more expensive than city prices. This is compounded by fuel prices which also increase with remoteness. Only the cost of housing appears to decrease the more remote the area is from capital cities. However, the quality of the housing and the numbers who dwell in them is another variable. Access to clean water is another factor. Roads and transport, access to telecommunication networks and information technology is another variable again.[15] All these impact on the health and welfare of those who live in fairly remote areas. In addition are the human factors.

The *Public Health Association of Australia* notes that: 'The inequality between rural and urban areas is being exacerbated by the accelerating breakdown of social and economic infrastructure in rural areas.'[16] There are generally higher rates of unemployment, particularly for youth in some rural and remote areas. Changes in global markets and reduced demand for agricultural products has not helped nor has the withdrawal of many services, such as banks, which provided an entry into the workforce for many young people. The consequent lack of purposive activity may be demoralising and lead some youth to engage in risky behaviours.[17]

In isolated rural and remote areas there appears to be an over-reliance on unpaid carers, mostly women, in caring

for the aged, disabled, sick and young. The provision of care by people who lack specific medical or nursing training is not ideal. Nor is it an option that they would choose, yet they have no alternative due to the lack of specific services to cater for vulnerable groups. These carers often lack support and are burdened by ongoing physical, mental and financial demands. The paucity of certain services in isolated regions cover a number of specialities, particularly mental health, post-acute hospital care, palliative care, oral health, and obstetric services.[18]

Educating a rural health workforce

Another lack for country dwellers is the opportunity to access health professional education without leaving their rural base. Perceived barriers are the costs of university study, competing for places with city students, and the distance between university and family.[19] This lack has been partially addressed by some Universities sending students to rural areas for clinical experience, or setting up rural campuses which provide some health professional education. There are also various scholarships to attract people into medicine, pharmacy or nursing.[20] For example, *Medical Rural Bonded Scholarships* are offered to medical students prepared to commit to at least six years of rural practice once they complete their basic medical and postgraduate training.[21] However, this type of strategy is not fully endorsed by some groups because of its perceived coercive and obligatory connotations.[22]

Efforts to improve rural and remote health

The *Department of Health and Ageing* has a number of schemes to try to address the shortfall in health service provision in rural and remote areas. This includes its *Rural Health Strategy Scheme* called 'Healthy Horizons'. A report on its implementation is due this year to the *Australian Health Ministers's Advisory Council.* Another strategy involves funding approved applicants for the 'Rural Private Access Program' which assists the viability of rural private hospitals and supports the provision of privately insurable health services in rural, regional and remote Australia.[23] The *Australian Medical Association* recommends that E-health systems be implemented in rural and remote areas with systematic introduction of infrastructure to enable full use of health informatics.[24]

Many of the recent initiatives to improve the health of Australians living in rural and remote areas involve pooling funds and collaborating services in shared multipurpose facilities.[25] The community is also being encouraged to utilise their own expertise. Locals know what is best for their own community. Drawing on an area's social and human capital is not a new concept. Transforming this wealth into a rural health strategy is understating the effects that the ongoing rationalisation and privatisation of health care has had outside metropolitan and larger regional centres.

Distributive justice

Whilst there is no doubt that there are many thriving and resilient rural and remote communities, there are also those facing demoralisation and hardship due to economic downturns, adverse weather conditions, lack of employment opportunities and the rising costs of essential services. Promoting community capacity as a viable option to help meet the health care needs of rural and remote area Australians will only partially reduce the gap in health status currently experienced between city and country. The inequity and lack of distributive justice in health care for rural and remote Australians must be addressed. In addition to relying on the good will of communities to look after their own it is imperative that all levels of government use tax revenue to serve the common good, particularly health care, to all regardless of where they live.

ENDNOTES

[1] AIHW 2005. Rural, regional and remote health. Indicators of health. AIHW. Cat. No. PHE 59. Canberra: AIHW (Rural Health Series no. 5), www.aihw.gov.au accessed 23/5/05; and C White, (2002) Medical service provision in rural and remote Australia – Background paper, Queensland Rural Medical Support Agency, Brisbane; and D Wilkonson, K Cameron, 'Cancer and cancer risk in South Australia: what evidence for a rural-urban health differential?, Australian Journal of Rural Health, (2004) 12(2):61-66.

[2] P Harvey, 'Tantalus and the Tyranny of Territory: Pursuing the dream of parity in rural and metropolitan population health outcomes through primary health care programs', Australian Journal of Primary Health (2004) 10(3):83-88.

[3] J Tudor Hart, 'The Inverse Care Law', The Lancet, 27 Feb 1971.

[4] T Dennis et al., 'Lipid-lowering therapy with statins in high-risk elderly patients. The Treatment-Risk Paradox', JAMA (2004) 291(15):1864-1870.

[5] K Sadkowsky et al., Health Services in the city and the bush: Measures of access and use derived from linked administrative data, Occasional Papers: New Series Number 13, September 2001, Commonwealth Department of Health and Aged Care.

[6] Australian Indigenous HealthInfoNet (2005) Summary of Australian Indigenous health, accessed 30/5/05 http://www.healthinfonet.ecu.edu.au/html_keyfact/keyfacts_plain_lang_summary.pdf

[7] R Denniss, 'Health Spending in the Bush', The Australian Institute, (September 2003), www.tai.org.au accessed 23/5/05.

[8] Department of Veteran Affairs The Administration of Veterans' Health Care, 2000, Commonwealth of Australia, http://www.anaogov.au accessed 23/5/05.

[9] S Quine et al., 'Health and access issues among Australian adolescents: a rural-urban comparison', Rural and Remote Health (2003) 3(3).

[10] Rural Doctors Association, Australian Local Government Association, National Farmers Federation, Health Consumers of Rural and Remote Australia, and Country Women's Association of Australia, Good Health to Rural Communities. A Collaborative Policy Document, March 2004.

[11] AIHW, 2002…

[12] Australian Medical Workforce Advisory Committee (2000), The General Practice Workforce in Australia, AMWAC Report 2002.2, Sydney, http://amwac.health.nsw.gov.au accessed 30/5/05.

[13] M Metherell, 'More for GPs ready to go bush', Sydney Morn-

ing Herald, 11 March 2005, www.smh.com.au accessed 23/5/05.
[14] Parliament of Australia Senate, Report on the Inquiry into Nursing. The Patient Profession: Time for Action, June 2002.
[15] C Burns et al., 'Food cost and availability in a rural setting in Australia', Rural and Remote Health (online) (4/11/04), http://rrh.deakin.edu.au accessed 27/5/05; and AIHW 2005. Rural, regional and remote health. Indicators of health. AIHW. Cat. No. PHE 59. Canberra: AIHW (Rural Health Series no. 5), www.aihw.gov.au accessed 23/5/05; and Catholic Welfare Australia, A Litany of Disadvantage. Rural Communities of Australia, October 2000, www.catholicwelfare.com.au , accessed 1/7/05.
[16] PHAA, Rural Health, Policy adopted 1991, amended 1999, www.phaa.net.au, accessed 30/5/05.
[17] Catholic Welfare Australia 2000 ….
[18] S Siegloff, R Aroni, 'Mental illness and 'Self'- management in rural Australia: Caregivers' perspectives', Australian Journal of Primary Health (2003) 9(2-3):90-99; N Harris et al., 'Hospital and after: experience of patients and carers in rural and remote North Queensland, Australia', Rural Remote Health (2004) 4; K White et al., 'Out of sight out of mind: reframing remoteness in providing palliative care in remote Australia', Collegian (2004) 11(3):29-33; C Adams et al., 'Dental visits in older Western Australians: a comparison of urban, rural and remote residents', Australian Journal of Rural Health (2004) 12 (4):143-149; ABC On-line, 'Birthing services seen as crucial to rural areas', www.abc.net.au, 14/12/2004 accessed 27/6/05.
[19] S Gorton, P Buettner, 'Advance Australia fairly', Australian Journal of Rural Health (2004) 12:93-94.
[20] The Victorian Universities Rural Health Consortium (VUHRC), http://www.vurhc.org.au and Services for Australian Rural and Remote Allied Health, http://www.sarrah.org.au accessed 10/6/05; and National Rural Health Alliance Inc, A Quality Rural Placement System for Health Students, April 2004, www.ruralhealth.org.au accessed 4/7/05.
[21] Medical Rural Bonded Scholarships, www.health.gov.au accessed 1/7/05.
[22] National Rural Health Alliance Inc., Bonded Medical Scholarships and University Places, Position Paper, November 2003, www.ruralhealth.org.au accessed 1/7/05.
[23] Department of Health and Ageing, Rural Health, http://www.health.gov.au accessed 10/6/05.
[24] AMA Position Statement, Rural and Remote Health, 2001.
[25] For example, The Multi Purpose Services Program, www.health.vic.gov.au/ruralhealth/hservices/mpurpose.htm accessed 4/7/05.

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Post-Coma Unresponsiveness

Clinicians are beginning to understand the varied outcomes following severe brain injury, one of which is post-coma unresponsiveness (PCU). However, much still needs to be done to fully comprehend this elusive state. Current clinical knowledge is outlined below.

Coma follows immediately from a severe brain injury, which is typically brought about in a number of ways:

- *Trauma*--such as that suffered in a motor car accident,
- *Anoxia*--when the brain is starved of oxygen for a prolonged period,
- *Intoxication*--through an overdose of prescribed medication or illicit drugs, or
- Serious *infection*--by bacteria (such as pneumococcus), virus (lyssavirus) or parasite (malaria)

While much longer periods have been documented, prolonged coma is extremely rare---in general, comatose patients who survive begin to awaken and recover within hours to weeks at most. Those that don't regain consciousness die or lapse into post-coma unresponsiveness (PCU). This state has not been well studied, and was traditionally known as the vegetative state. However, this term has pejorative connotations and recent NHMRC guidelines actively promote the term PCU. It also excludes other unresponsive states (such as the terminal phase of Alzheimer's disease) that have different aetiologies and ethical considerations.[1]

Physiopathology

The hallmark of PCU is the 'persistent dissociation of the two cardinal elements of human consciousness---wakefulness and awareness.'[2] Awareness is thought to be absent through disconnection of thalami and cerebrum despite the system responsible for wakefulness functioning normally.[3] While the brainstem is mostly intact in PCU patients, the cerebral hemispheres are severely damaged. As shown in the figure below, global metabolism within the brain is only 30-40% of the normal range of values. Thus awareness is postulated to be dependent on integral functioning of the cerebral cortices in addition to subcortical connections.[4]

Comatose patients have no awareness or wakefulness, while those in PCU only lack awareness, going through periods of apparent sleep and arousal. The brainstem remains functional and it is the preservation of this and associated autonomic (visceral) structures that maintains wakefulness in these patients. While wakefulness can be ascertained, there is as yet no direct way to measure awareness, a critical component of human consciousness. In rare cases, isolated cortical networks have been found intact, correlating with unusual behavioural fragments such as the utterance of single words unrelated to environmental cues. The preservation of isolated areas, however, is not indicative of recovery.[5]

Diagnosis

Diagnosis is fraught with difficulties and can never be absolutely certain. There are no failsafe diagnostic tools; clinical diagnosis remains best practice. As a general

guide, at least four conditions must be met:

1. The patient shows no behavioural evidence of awareness of self or environment,
2. There is brain damage, usually of known cause, consistent with the diagnosis,
3. There are no reversible causes present and
4. At least six (in nontraumatic brain injury) and usually 12 (in traumatic cases) months have passed since onset.[7]

It is becoming increasingly apparent that PCU must be distinguished from other severe disorders of consciousness (DOCs), necessitating differential diagnosis. Two examples illustrate this well. 'Locked-in Syndrome' is an extremely rare occurrence but is dramatically distinct from PCU (see figure below). Pathology of the brainstem renders these patients effectively paralysed but neither their wakefulness or awareness are diminished. While

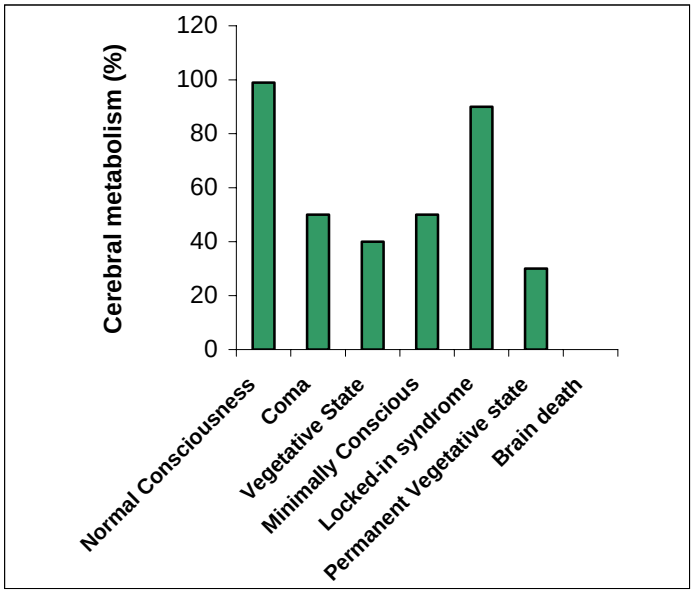

Figure. Brain metabolism in various states of consciousness [6]

being incapable of voluntary movement, there is no doubt they are conscious and are capable of communicating via eye or eyelid movements.[8]

The minimally conscious state is also distinct from PCU. This refers to patients who, despite severe cognitive impairment, are conscious and display signs of awareness. Patients that do emerge from PCU often become minimally conscious before stabilising or further improving.[9] There are also other diagnostic classifications emerging as neuroimaging and clinical diagnosis improves. This all serves to highlight the fact that misdiagnosis is possible; the only reliable way to proceed is careful clinical diagnosis, by several teams, and over a period of time.

Prognosis

Data on prognosis of PCU, indeed all severe DOC, are limited and open to interpretation because of the difficulty in accurate diagnosis and ambiguity in the definition of disorders.[10] Furthermore, there have been no comprehensive studies on PCU patients and very few reviews or meta-analyses on their prognosis. However, it has been shown that the outlook for patients in PCU does depend on their age, the cause of their condition (whether traumatic or non-traumatic) and its duration. Within the first few months of the condition, the vast majority (90%) either regain consciousness or die.[11] Recovery can be twofold--recovery of consciousness and, less likely, recovery of consciousness in addition to some functional recovery, such as speech.

The most broad-ranging review of adult PCU patients is that of the Multi-Society Taskforce on PVS, the findings of which are summarised below.[12]

- Recovery after traumatic injury

Recovery of consciousness varied with time. 3 months after injury, a third of all patients had recovered consciousness, while two thirds had died or remained in PCU. At 6 months, this improved to 46% and 52% by 12 months. Recovery after one year was reported in less than 2% all patients.[13] Younger patients have a slightly better prognosis; nonetheless, all had moderate to severe disabilities after regaining consciousness.

Good recovery of function is also very unlikely. At one year, among 434 patients diagnosed with PCU, 33% had died, 15% remained in that state, 28% had severe disability, 17% had moderate disability, and 7% had a good recovery. Of that 7%, almost all patients showed improvement within 6 months after injury. For the entire group, the incidence of a good recovery beginning 6-12 months after injury was less than 0.5 %. No patient had a good recovery that began after 12 months. A later recovery was almost invariably associated with severe disability.

- Recovery after nontraumatic injury

Adults in this group have a poorer prognosis than those described above, with 85% or more dying within the first month after the insult or remaining in PCU.[14] Of a group of 169 patients sustaining such injuries, only 11% had recovered consciousness three months after injury; 3 months later, only two additional patients had recovered consciousness. One year after injury, 15% of this group had recovered consciousness, 32% were still in PCU, and over half had died.

Recovery of function in the 15 % of patients who regained consciousness was extremely poor. Only one patient had a good recovery. Isolated reports of individual patients with good functional recovery after nontraumatic injury have been published. Improvement began, though, within two months after a hypoxic (lack of oxygen) injury.[15] There have been reports of five other patients who began to recover from a vegetative state more than six

months after a nontraumatic injury. Two had moderate disability, and three had severe disability.

Problems

Consciousness is ambiguous—it is complex and by no means an all or nothing phenomenon.[16] And the lack of any definitive diagnostic test for consciousness complicates the issue. Furthermore, there is a severe lack of studies investigating the long-term outcomes of patients in PCU or other serious DOCs.[17] Research is desperately needed in this area. Comparative autopsy studies on patients diagnosed, not only with PCU, but all types of minimal consciousness, are needed in order to determine more accurately the underlying pathology. Correlative pathological and radiological studies could also be performed so that the real value of prognostic neuroradiological scans could be accurately assessed.[18] Further studies are also needed into better treatment options for this group of patients.

ENDNOTES

[1] NHMRC Post-coma Unresponsiveness (Vegetative State): A Clinical Framework for Diagnosis. Information Paper. (Commonwealth of Australia, 2004)
[2] J Bernat 'Questions remaining about the minimally conscious state.' Neurology 58 (2002) 337-8
[3] H Kinney and M Samuels 'Neuropathology of the persistent vegetative state: a review.' Journal of Neuropathology and Experimental Neurology 53 (1994) 548-58
[4] A Zeman 'Consciousness.' Brain 124 (2001) 1263-89
[5] S Laureys et al, 'Brain function in coma, vegetative state, and related disorders.' Lancet Neurology 3 (2004) 540
[6] adapted from S Laureys et al 'Brain function…..'
[7] D Wade 'Ethical issues in diagnosis and management of patients in the permanent vegetative state.' BMJ 322 (2001) 352-4
[8] J Giacino et al, 'The minimally conscious state: definition and diagnostic criteria.' Neurology 58 (2001) 49–53
[9] Royal College of Physicians. 'The Vegetative State. Guidance on Diagnosis and Management.' 2003 http://www.rcplondon.ac.uk/pubs/wp_vegetativestate.pdf (accessed 8/8/05)
[10] J Giacino and J Whyte 'The vegetative and minimally conscious states: Current knowledge and remaining questions.' Journal of Head Trauma Rehabilitation 20/1 (2005) 30-50
[11] D Wade 'Ethical Issues….'
[12]The Multi-Society Task Force on PVS. 'Medical Aspects of the Persistent Vegetative State— Second of Two Parts.' New England Journal of Medicine 330 (1994) 1572-9
[13] S Levin et al, 'Vegetative state after closed-head injury: a Traumatic Coma Data Bank Report.' Archives of Neurology 48 (1991)580-5
[14] D Bates 'Defining prognosis in medical coma.' Journal of Neurology and Neurosurgical Psychiatry 54 (1991)569-71
[15] J Jaggi et al, 'Relationship of early cerebral blood flow and metabolism to outcome in acute head injury.' Journal of Neurosurgery 72 (1990)176-2 and P Hansotia 'Persistent vegetative state: review and report of electrodiagnostic studies in eight cases.' Archives of Neurology 42 (1985)1048-52
[16] J Bernat 'The boundaries of the persistent vegetative state.' Journal of Clinical Ethics 3 (1992) 176-80
[17] NHMRC Information Paper
[18] ibid.

Michael Herbert ✠

Medically Administered Nutrition & Hydration and Ethics

The basic moral principle in health care requires us to have medical treatment that is reasonably required in the circumstances to restore health or to save life. It is the responsibility of healthcare professionals to interpret this duty in dialogue with their patients. .

Duty of reasonable care and treatment of patients

Traditionally, reasonable care of life and health meant having recourse to 'everything possible'. Today with modern high-tech medicine this slogan is no longer a useful guide. When the withholding of treatment is morally justified, its withdrawal is also justified bearing in mind the reasonable wishes of the competent patient. However, it is psychologically more difficult to withdraw futile treatment once it has commenced than to withhold it. This general duty also needs to be interpreted in the light of the Christian Catholic tradition which is optimistic about human life, not withstanding suffering, sickness and the prospect of death that confronts us all. Christ taught that the new life of faith and grace, in the light of the resurrection of Jesus, should encourage us to look forward to sharing in the glorious risen life that awaits us after death. Death is not the end of everything – it enables us to begin an eternal life of happiness.

Doctors and the State are not morally obliged to go beyond the bounds of reason to provide all possible medical treatments. The availability of medical resources, public funding, personnel, family and the prospects for patients' recovery all enter into the complex judgement of *the duty of reasonable treatment in the circumstances.*

Medical treatment is to serve patients who should not be subjected to the duress of enduring technological interventions against their reasonable wishes. There is a duty to use *ordinary* or *proportionate* means of health care, not *extraordinary* or *disproportionate* means. It is not always easy to draw the line in individual cases.

Medically administered nutrition and hydration

Doctors, nurses, carers and ethicists agree that medically administered nutrition and hydration (MANH) should be offered to all competent patients who cannot eat and drink for as long as they need it. 'In all cases, the judgements about care due to patients should be based on the relevant medical and ethical criteria, not on the quality of the patient's life or state of consciousness.'[1] The situation of patients on MANH needs to be reviewed periodically because many patients can make a successful return to oral feeding. When the condition preventing a patient from eating or swallowing is treatable by surgery or curable over time, all agree MANH is obligatory. Though MANH does not cure a pathology, it sustains life for patients who can assimilate it and can prevent suffering from dehydration, hunger and thirst. It would be inhuman to refuse to offer MANH to competent and conscious mentally impaired patients. Sometimes patients lose their appetite and this also occurs as part of the dying process, without any hint or suggestion of a suicidal intention. Failure to respect the dying process would show a lack of respect for the dying person.

Patients in post-coma unresponsiveness and MANH

It is more respectful to speak of patients in a *post-coma unresponsiveness* (PCU) than in a permanent vegetative state. This is the terminology preferred by the National Health and Medical Research Council.[2] Australia's National Health Advisory Authority, referring to patients in PCU, has recently stated that 'awareness cannot be reliably excluded' by any tests.[3]

For some time there had been no agreement among Catholic moral theologians and ethicists on whether there was always a moral duty to continue to provide MANH to patients who had been diagnosed with moral certainty to be in an irreversible unconscious state as a result of a severe stroke or trauma. Some held it was morally permissible to withdraw MANH from patients in an irreversible unconscious condition. There was, however, agreement that it was morally wrong to give these patients a lethal injection.

Pope John Paul II on 20 March 2004, in his address to an International Congress of Catholic doctors and ethicists at the Vatican, stated that patients in PCU were human beings with intrinsic value and personal dignity, with a moral right to 'basic health care (nutrition, hydration, cleanliness, warmth, etc.) and to the prevention of complications related to confinement to bed.' He emphasised that

> the administration of water and food, even when provided by artificial means, always represents a natural means of preserving life, not a medical act. Its use, furthermore, should be considered, in principle, ordinary and proportionate, and as such morally obligatory, to the extent in which and as long as it is seen to achieve its proper purpose, which in the present case consists in providing nourishment to the patient and alleviation of his suffering. Death by starvation or dehydration is, in fact, the only possible outcome as a result of their withdrawal. In this sense it ends up becoming, if done knowingly and willingly, true and proper euthanasia by omission.

The Australian Catholic Bishops' Committee for Doctrine and Morals agreed it would be different 'if the patient is unable to assimilate the material provided or if the manner of the provision itself causes undue suffering to the patient, or involves undue burden to others.'[4] In this case the benefit of MANH would not be proportionate to its burdens or harm.

The Pope's teaching applies in principle and does not rule out the ethical use of professional judgement by doctors should other medical counter-indications arise. Doctors and health carers are to determine by careful clinical assessments whether patients are truly being nourished, their sufferings alleviated, prevented or even increased by the use of MANH.

The Pope's address is directed specifically to the care of patients in PCU. It would also apply in principle to other unconscious or incompetent patients who are not dying but are suffering from 'advanced dementia, severe stroke, advanced metastases or advanced neurogenic disease.'[5] His speech was not meant to modify the normal ethical practices of palliative care professionals for their patients as they approach imminent death. In these cases it suffices to keep dying patients comfortable by continuing normal palliative care and/or using an intravenous drip and caring for their mouth hygiene by the use of ice cubes.

Consent of the patient

Pope John Paul II spoke of the obligation to use MANH, but made no reference to what patients in developed and developing countries could, or would wish, to be done to themselves. Earlier Pope Pius XII had made it clear that doctors derive their rights and duties to treat from their patients:

> The rights and duties of the doctor are correlative to those of the patient. The doctor, in fact, has no separate or independent right where the patient is concerned. In general, he can take action only if the patient explicitly or implicitly, directly or indirectly, gives him permission.[6]

The following passages from the *Declaration on Euthanasia* are very valuable:

> 'It is very important to protect, at the moment of death, both the dignity of the human person and the Christian concept of life, against a technological attitude that threatens to become an abuse. …A right to die [means] the right to die peacefully with human and Christian dignity. From this point of view, the use of therapeutic means can sometimes pose problems. ...In the final analysis, it pertains to the conscience either of the sick person, or of those qualified to speak in the sick person's name, or the doctors, to decide in the light of moral obligations and of the various aspects of the case. …In any case, it will be possible to make a correct judgement as to the means by studying the type of treatment to be used, its degree of complexity or risk, its cost and the possibilities of using it, and comparing these elements with the result that can be expected, taking into account the state of the sick person and his or her physical and moral resources. …
> One cannot impose on anyone the obligation to have recourse to a technique which is already in use but which carries a risk or is burdensome. Such a refusal is not the equivalent of suicide; on the contrary, it should be considered as an acceptance of the human condition, or a wish to avoid the application of a medical procedure disproportionate to the results that can be expected, or a desire not to impose excessive expense on the family or the community'[7].

The Australian Catholic Bishops' Committee for Doctrine and Morals agrees that MANH involves a medical decision:

> The Pope's statement does not explore the question whether artificial feeding involves a medical act or treatment with respect to insertion and monitoring of the feeding tube While the act of feeding a person is not itself a medical act, the insertion of a tube, monitoring of the tube and patient, and prescription of the substances to be provided, do involve a degree of medical and/or nursing expertise. To insert a feeding tube is a medical decision subject to normal criteria for medical intervention.[8]

Pope Pius XII stated that the use of ordinary means for the preservation of life and health was morally necessary and gave a balanced explanation of what this means that is still relevant today:

> …normally one is held to use only ordinary means – according to circumstances of persons, places, times, and culture – that is to say, means that do not involve any grave burden for oneself or another. A more strict obligation would be too burdensome for most men and would render the attainment of the higher, more important goods too difficult. Life, health, and all temporal activities are in fact sub-ordinated to spiritual ends.[9]

There is no need to limit the meaning of 'burdensome' to what is physically painful. It can also refer to what is psychologically burdensome which draws on one's self-understanding over time. The use of the terms 'spiritual ends' refers to a person's typical human activities of thinking, judging, loving, choosing and praying, etc., -- in short one's rationally self-conscious life. As Dr Eric Cassells says suffering is

> a specific state of distress that occurs when the intactness or integrity of the person is threatened or disrupted. … Suffering is related to the severity of the affliction, but that severity is measured in the patient's terms and is expressed in the distress they are experiencing, their assessment of the seriousness or threat of their problem, and how impaired they feel themselves to be.[10]

Cassell stresses that the patient's perspective is important and unique on account of its essential link to each person's subjectivity:

> Because suffering is individual in its origins and expressions, truly to know why and how someone suffers it is necessary to know the person in his or her particularity. But that … total knowledge of a person is impossible. Suffering is necessarily private because it is ultimately individual.[11]

In the subjective domain, the sick themselves, not others, are the experts on how they feel and personally experience different kinds of burdens:

> Suffering involves some symptom or process that threatens the patient because of fear, the meaning of the symptom, and concerns about the future. The meanings and the fear are personal and individual, so that even if two patients have the same symptoms, their suffering would be different.[12]

The Pontifical Council Cor Unum admitted the criteria for assessing extraordinary means can be subjective as well as objective:

> Other criteria are *subjective*: such as not giving certain patients psychological shocks, anxiety, uneasiness and so on. It will always be a question, when deciding on the measures to be taken, of establishing to what extent the means to be used and the end being sought are proportionate. Among all the criteria for decision, particular importance must be given to the quality of life to be saved or kept living by the therapy.[13]

Depending on their condition and circumstances, patients vary in their capacity to cope with MANH. Some sick and/or elderly patients who at first agreed to have MANH, with the passage of time, may find MANH is causing them much suffering and distress. There is a long Catholic tradition supporting that importance be given to

the informed views of competent patients in assessing pain and suffering. They could morally refuse on reasonable grounds to have a feeding tube inserted or to have MAHN withdrawn in order to avoid undue burdens or suffering. Needless to say, it would be unethical to force feed competent patients against their reasonable wishes.

It is, however, premature to conclude that it would be ethical for competent patients, distressed by the thought of MANH continuing after they become irreversibly unconscious, to decide in advance to have MANH withdrawn when that time comes.[14]

Institutional policies

Healthcare institutions will need to draw up their own ethical guidelines and protocols in relation to MANH. Catholic healthcare institutions will need to be draw up their own in the light Pope John Paul's address, traditional and official Catholic teaching and any Statement made by the Australian Catholic Bishops Conference. The Pope's statement affirms the presumption in favour of giving MAHN to all patients who need it, "while recognising that in particular cases this presumption gives way to the recognition that the provision of nutrition and hydration would be futile and unduly burdensome."[15] Healthcare professionals in Catholic hospitals will need to accept their healthcare institution's policies in practice, recognising that there is scope for the exercise of professional clinical judgements that may justify not inserting or withdrawing a feeding tube in agreement with the "normal criteria for medical interventions"[16]

If a patient's lawful agent requests that MANH be withdrawn in circumstances that clearly fall outside a Catholic hospital's policy, it may be necessary to discuss transferring the patient to another hospital. The situation would be like a pregnant woman asking for a direct abortion in a Catholic hospital. Clearly a suitable educational program will be needed to clarify the implications of each Catholic hospital's policy re MANH if harmony is to be maintained among hospital staff. A good educational program will go a long way towards fostering harmony within the hospital and avoid the need of having recourse to conflict resolution procedures.

ENDNOTES

[1] *Briefing Note on the Obligation to provide Nutrition and Hydration,* Australian Bishops' Committee for Doctrine and Morals, Bishops' Committee for health Care and Catholic Health Australia, 3 Sept. 2004. www.acbc.catholic.org.au , accessed 18 August 2005
[2] *Post-coma unresponsiveness (vegetative state*), Australian Government. National Health and Medical Research Council, Commonwealth of Australia, 2004, p. xi.
[3] Ibid. xi.
[4] *Briefing Note*
[5] *Briefing Note*
[6] Pope Pius XII, Address in French to the International Congress of Anesthesiologists, *Acta Apostolica Sedis* , 49 (1957) 1030; 'The Prolongation of Life', *The Pope Speaks* (1957-58) 395-97.
[7] Congregation for the Doctrine of the Faith, *Declaration on Euthanasia*, Vatican Council II. More Postconciliar Documents, ed. Austin Flannery, O.P. Dublin: Dominican Publications, 1980. 514-15
[8] *Briefing Note*
[9] Pope Pius XII, Address in French to the International Congress of Anesthesiologists, *Acta Apostolica Sedis* , 49 (1957) 1030; 'The Prolongation of Life', *The Pope Speaks* (1957-58) 395-97.
[10] Eric J Cassell M.D,'Diagnosing Suffering: A Perspective' *Annals of Internal Medicine,* 131 (7) 1999, 531-34.
[11] Eric J Cassell M.D., 'Recognizing Suffering', *Hastings Center Report,* May-June 1991, 31;
[12] Ibid.
[13] Pontifical Council *Cor Unum* "*Questions of Ethics Regarding the Fatally Ill and the Dying*", Vatican Polyglot Press, 1981See Cor Unum "Questions of Ethics..." p.7-8.
[14] John Paul II is satisfied with moral certainty for the declaration of brain death for the death of a person, See the Address of John Paul II to the 18th International Congress of the Transplantation Society , 29 August 2000.
[15] *Briefing Note*
[16] *Briefing Note*

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