Australian Government

Department of Health and Ageing

Australia and New Zealand Horizon Scanning Network

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Horizon Scanning Technology

Prioritising Summary

Non-heart beating donors for kidney transplantation

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AHTA

Adelaide
Health Technology
Assessment

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PRIORITISING SUMMARY

REGISTER ID: **000524**

NAME OF TECHNOLOGY: **NON-HEART BEATING DONORS FOR KIDNEY TRANSPLANTATION**

PURPOSE AND TARGET GROUP: **PATIENTS WITH CHRONIC KIDNEY DISEASE WHO REQUIRE KIDNEY TRANSPLANTATION**

STAGE OF DEVELOPMENT (IN AUSTRALIA):

☐	Yet to emerge	☐	Established
☐	Experimental	☐	Established *but* changed indication or modification of technique
☒	Investigational	☐	Should be taken out of use
☐	Nearly established		

AUSTRALIAN THERAPEUTIC GOODS ADMINISTRATION APPROVAL

☐	Yes	ARTG number
☐	No	
☒	Not applicable	

INTERNATIONAL UTILISATION:

COUNTRY	LEVEL OF USE		
	Trials Underway or Completed	Limited Use	Widely Diffused
France	✓		
Spain	✓		
Italy	✓		
The Netherlands	✓		
Japan	✓		
United Kingdom	✓		

IMPACT SUMMARY:

The use of organs from non-heart beating donors, rather than from beating-heart donors, is intended to increase the number of organs available for transplantation. This technology would be made available through specialist transplant hospitals for patients who require kidney transplantation.

Chronic kidney disease (CKD) is marked by long-term and usually irreversible loss of kidney function. Initial evidence of kidney damage or reduction in kidney function can be detected by routine blood or urine testing with the most common indicators of kidney damage being elevated protein levels in the urine (proteinuria or albuminuria), blood in the urine (haematuria) or raised blood levels of the waste products of protein metabolism such as urea or creatinine. Kidney function is measured by the glomerular filtration rate (GFR), a measure of the amount of blood the kidneys clear of waste products in one minute (AIHW 2009).

Chronic kidney disease is classified into five stages of disease severity based on evidence of kidney damage and the degree of kidney function reduction, classified by GFR:

- Stage 1: Kidney damage with GFR at least 90 mL/min/1.73 m2. People with stage 1 CKD are usually asymptomatic with no decrease in GFR but will have evidence of kidney damage (structural or functional abnormalities of the kidney).
- Stage 2: Kidney damage with GFR 60 to 89 mL/min/1.73 m2. People with stage 2 CKD have evidence of kidney damage with some reduction in GFR. Most patients at this stage have no symptoms but may have high blood pressure and laboratory abnormalities indicating dysfunction in other organs.
- Stage 3: GFR 30 to 59 mL/min/1.73 m2. People with stage 3 CKD have a significant reduction in GFR. They may or may not show other signs of kidney damage. Increased levels of urea and creatinine are detected in the blood and there may be evidence of dysfunction in other organs. Although some patients may be symptomatic many remain asymptomatic even though their kidney function may be reduced by as much as 70 per cent.
- Stage 4: GFR 15 to 29 mL/min/1.73 m2. People with stage 4 CKD have severely reduced kidney function. Blood levels of urea and creatinine are increased, and there is greater evidence of dysfunction in other organs. Patients usually have only mild symptoms.
- Stage 5: GFR less than 15 mL/min/1.73 m2. In most cases, stage 5 CKD is marked by a range of symptoms and laboratory abnormalities in several organ systems, collectively referred to as uraemia. Patients at this stage may need to be prepared for therapy (either dialysis or transplant), which will be required when kidney function is no longer sufficient to sustain life (AIHW 2009).

Patients with chronic kidney disease (stage 5) or end-stage renal disease (ESRD) usually receive dialysis three times per week in a specialist renal unit. More frequent haemodialysis has been demonstrated to be beneficial to ESRD patients in terms of both survival and quality of life. Benefits for patients include less hypertension,

reduced cardiovascular disease, improved patient appetite and nutrition, improved serum albumin levels, improved anaemia and a decrease in the incidence of stroke (Davenport et al 2007; Gura et al 2005).

The preferred treatment option for ESRD is transplantation, with advantages for the patient (lower long-term mortality risk, increased quality of life) and the health system (lower costs). The more time spent on dialysis prior to transplantation increases mortality risk and decreases donor kidney survival rates. However, only a small fraction of patients on dialysis are on the kidney transplantation waiting list. Not all patients are good candidates for kidney transplantation and factors taken into consideration include age, obesity, smoking status, co-morbidities and any history of drug or alcohol abuse. The number of available donor kidneys limits the number of kidney transplants performed per year. Kidneys from deceased donors are allocated by national (Australia and New Zealand) and state-based schemes according to priority, however many kidney transplants are a result of living donors who are usually family members and not necessarily genetically related (ANZDATA 2009). Australia has one of the lowest rates of organ donation with deceased donor rates of approximately 9–10 donors per million population (Prakoso et al 2010). The waiting list for kidney transplantation is the longest, and the average waiting time for patients waiting for a deceased donor is three to four years (ANZDATA 2009). Meier-Kriesche et al reported on the effect of length of waiting time on dialysis and the impact on transplantation success. There was an increase in the risk of death and death-censored graft loss with increasing time spent on dialysis prior to transplantation. The increase in mortality risk for waiting relative to transplantation was 21 per cent for a 6–12 month wait, 28 per cent for a 12–24 month wait, 41 per cent for a 24–36 month wait, 53 per cent for a 36–48 month wait and 72 per cent for a wait greater than 48 months. A later study reported that waiting for a live donor transplant while on dialysis for more than two years reduced graft survival to the same level as that for deceased donor transplants performed within six months of commencing dialysis (Kanellis 2010).

Non-heart beating organ donors (NHBD) are individuals who cannot be classified as brain stem dead but whose death has been certified by the absence of a heat beat ie cardiac arrest. Organs obtained from NHB donors may be referred to as 'controlled' where cardiac arrest was expected, for example in someone being cared for in an intensive care unit, or 'uncontrolled' where death occurs unexpectedly, and donation follows unsuccessful resuscitation or cardiac arrest (Bond et al 2009). Donors are classified according to the Maastricht categories:
Category I: Dead on arrival or an uncontrolled death. Once consent is obtained, intercostal catheters are inserted to enable pneumoplegia solution to be infuse into the thorax within 1-2 hours of death. This moment marks the beginning of 'cold ischaemic time'
Category II: Unsuccessful resuscitation – uncontrolled death. This may occur in an

emergency situation – either with paramedics or in an emergency room, and therefore time of death is known.

Category III: Withdrawal of support and awaiting cardiac death – controlled death. Criteria for brain stem death have not been met, but further treatment is considered futile and treatment such as mechanical ventilation, is withdrawn.

Category IV: Cardiac death in a brain dead donor - uncontrolled death (Bond et al 2009; Snell et al 2004).

Organs obtained from NHBDs tend to have a prolonged 'warm ischaemic time'(the time when the donor is without a heart beat at normal temperature before the kidney has been flushed and perfused) which may result in higher rates of primary non-function or delayed graft function compared to kidneys obtained from brain dead donors. In addition, physiological factors, such as low blood pressure, that may occur in the donor prior to the declaration of cardiac death may lead to reduced tissue oxygenation and poor organ perfusion (Bond et al 2009).

Figure 1 is a schematic of a protocol for the retrieval of NHBD organs indicating timings prior to transplantation (Fieux et al 2009).
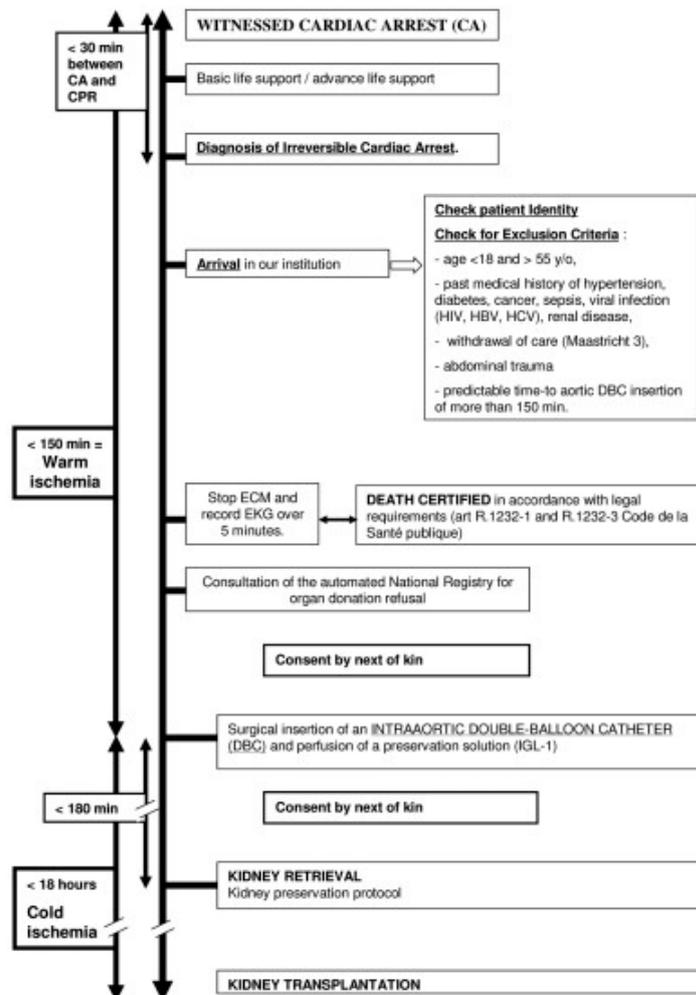

Figure 1   Protocol of care for non-heart beating donors

CLINICAL NEED AND BURDEN OF DISEASE

The major underlying disease causes of ESRD include: diabetes and diabetic nephropathy, where high blood sugar levels damage the blood-filtering capillaries of the kidneys; glomerulonephritis, where the glomeruli are damaged by chronic infection or immune diseases; or high blood pressure, which damages the blood vessels supplying the kidneys, reducing blood flow and decreasing kidney function (AIHW 2009).

In Australia one in three people are at risk of developing CKD, with one in seven having CKD and one in 1,400 requiring dialysis or a kidney transplant. CKD is the seventh highest cause of death in Australia. The need for dialysis is increasing within the Australian population due to the increasing incidence of diabetes and the ageing population. Over the past 25 years Australian population growth has been less than 40 per cent yet the need for dialysis and kidney transplants has increased 400 per cent (AIHW 2005). A similar rise in the incidence of patients commencing dialysis has been noted in New Zealand (Figure 2).
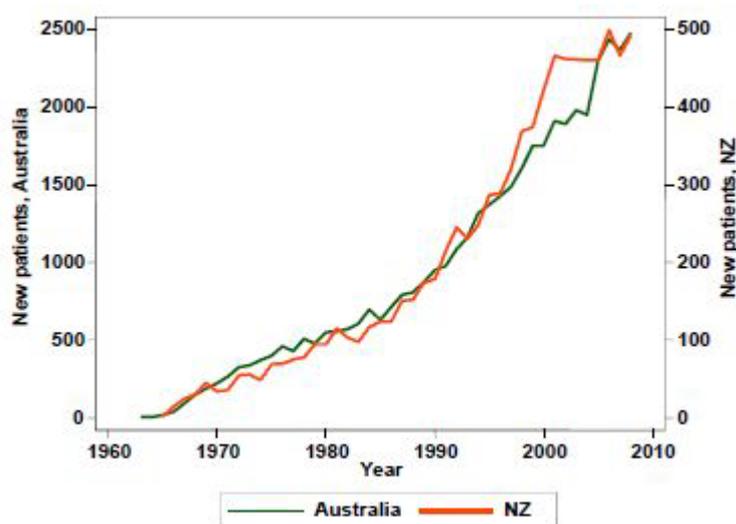
Figure 2   Number of patients starting renal replacement therapy dialysis or transplantation in Australia and New Zealand (ANZDATA 2009)

In Australia at the end of 2008, there were 17,578 people receiving renal replacement therapy, of whom 2,476 commenced therapy for the first time. Of these, 10,062 were receiving dialysis treatment and 7,516 received a functioning kidney transplant. Aboriginal/Torres Strait Islander patients are over-represented in this group, with a total of 1,147 people dependent on dialysis and 242 patients commencing renal replacement therapy for the first time in 2008. The highest incidence rate for renal replacement therapy occurred in the Northern Territory with 405 patients per million population. Victoria recorded the lowest incidence rate of 99 per million population. The average age of patients commencing renal replacement therapy was 60.4 years with a range of two days to 94.5 years. The prevalence of patients on dialysis has increased by approximately four per cent from 9,701 patients in 2007 to 10,062 in

2008. At the end of 2008 only 22 per cent of patients receiving dialysis who were aged ≤ 65 years were on the active kidney transplantation waiting list (ANZDATA 2009).

There was a 32 per cent increase in the number of kidney transplants carried out from 2007 (n=615) to 2008 (n=813). Of these 813 transplants, 354 (44%) were from living donors with equal numbers from related and non-related donors. For primary deceased donor grafts performed in 2007-2008, the 12 month patient and graft survival rates were 98 and 92 per cent, respectively. Survival rates were not provided for living donor grafts (ANZDATA 2009).

In Australia, a total of 1,482 dialysis dependent patients died in 2008 due to a number of causes including withdrawal from treatment (37%), cardiovascular (34%) and infection (10%). During the same period there were 167 deaths amongst patients who had received a kidney transplant (ANZDATA 2009).

At the end of 2008, there were 3,450 people receiving renal replacement therapy in New Zealand, and of these 492 commenced therapy for the first time in that year. A total of 2,099 were receiving dialysis whilst 1,351 had received a kidney transplant. The average age of patients commencing renal replacement therapy was 55.5 years with a range of three months to 82.3 years. The prevalence of patients on dialysis increased by only 1.5 per cent from 2,068 patients in 2007 to 2,099 in 2008. Approximately half of the patients on dialysis received home dialysis, with the majority of these patients (70%) having peritoneal dialysis. At the end of 2008 only 19 per cent of patients receiving dialysis who were aged ≤ 65 years were on the active kidney transplantation waiting list, and of these 24 per cent were Māori, 15 per cent were Pacific Islanders and 10 per cent were of Asian origin (ANZDATA 2009).

The number of kidney transplantations remained static in New Zealand with 123 performed in 2007 and 122 in 2008, of which 57 per cent came from live donors. For primary deceased donor grafts performed in 2007-2008, the 12 month patient and graft survival rates were 95% and 93% respectively (ANZDATA 2009).

A total of 356 dialysis dependent patients died in 2008 due to a number of causes including withdrawal from treatment (20%), cardiovascular (41%) and infection (18%). During the same period there were 26 deaths amongst patients who had received a kidney transplant (ANZDATA 2009).

DIFFUSION

Kidney transplantations using organs harvested from non-heart beating donors does occur in Australia and New Zealand but in small numbers. In the 2004 paper by Snell et al, it was estimated that since the inception of the transplantation program in Australia that only 50 out of a total of 25,000 transplanted kidneys came from non-heart beating donors (Snell et al 2004).

The Alfred Hospital in Melbourne is currently running a project to assess the practicality of a system that will allow the preservation and procurement of organs, including kidneys, from NHBDs with the aim of expanding the program to other institutions state wide and nationally (The Alfred Hospital 2010).

COMPARATORS

Australia and New Zealand already have one of the highest rates of home dialysis in the world, however the majority of dialysis is still centre (hospital or clinic) based, with patients usually receiving dialysis three times per week (Agar 2008). It is increasingly recognised that centre based haemodialysis is not the optimum patient management strategy regarding both health outcomes and patient survival times (ANZDATA 2006). Frequent haemodialysis is beneficial to ESRD patients both in terms of survival and quality of life and has been shown to be associated with decreases in mortality and RRT associated morbidity such as cardiovascular disease (Masterson 2008).

The alternative renal replacement therapy to dialysis is kidney transplantation. Suitable donor organs may be obtained from living donors who are not necessarily genetically identical, or from *heart beating* donors, that is patients deemed to be brain dead (Snell et al 2004).

SAFETY AND EFFECTIVENESS ISSUES

Fieux et al (2009) reported on a large series of *uncontrolled* NHBDs, that is donors who experienced sudden cardiac arrest who have failed to be resuscitated and the time of death is known (level IV intervention evidence). The protocol for the retrieval of organs in these donors is outlined in Figure 1 and after retrieval, all kidneys were perfused for eight hours using the LifePort® organ recovery system. Of the potential 122 donors (mean age 41.6 ± 11.6 years), 59 donors were excluded with reasons including unwitnessed cardiac arrest meaning no definitive time of death, next of kin refusal or a suspicious death. The unavailability of the intensive care unit (ICU) or transplant surgeon led to eight exclusions. Of the remaining 63 NHBDs admitted to hospital, a further seven were excluded due to various reasons including failure of cannulation and legal issues. A further 29 donors were excluded after the insertion of the double balloon catheter to begin perfusion, with the majority excluded after next of kin refusal. Although kidney retrieval was approved for 27 (43%) NHBDs, only 31 kidneys were transplanted out of a potential 54, with 23 kidneys being deemed non-viable due to reasons including viral serology (n=8) and macroscopic abnormalities (n=4).

Of the 63 NHBDs admitted to hospital, the majority of whom were male (86%), 37 (58.7%) of the cardiac arrests occurred during the day with the remaining 26 during the night. The majority of cardiac arrests occurred in the home (52.4%) with 30 and 16 per cent occurring outdoors and at work, respectively. Cardiopulmonary

resuscitation was performed by bystanders in 39 per cent of cases and automated external defibrillation by emergency personnel occurred in 37 per cent of cases. The mean time from emergency phone call to ICU admission was 48 minutes (range 13-120 minutes). The time between aortic catheter insertion and kidney retrieval was 175 minutes (range 110-225), despite the protocol for retrieval stipulating that this period should not exceed 180 minutes.

Follow-up was available in 24 of the 31 transplantations. Delayed graft function occurred in the majority of cases (92%) for a mean duration of 22 ± 9 days. Three patients experienced acute graft loss due to cessation of immune suppression medication by one patient, renal venous thrombosis in another and primary non-function possibly due to prolonged warm ischaemic time. For the remaining 21 patients, the mean creatinine[1] levels and creatinine clearance at 6-months were considered good at 152 ± 65 μmol/L and 66 ± 24 ml/min, respectively. The overall graft survival rate at six months was 89 per cent. Despite organ donation refusal or donor ineligibility accounting for 52 per cent of organs not able to be used, using NHBD donors resulted in a 10 per cent increase in the kidney transplantation rate over a 17-month period (Fieux et al 2009).

In a smaller Spanish study, the function of kidneys retrieved from NHBDs who had experienced attempted resuscitation using mechanical chest compression devices (n=28) was compared to a historical group of patients who experienced attempted resuscitation by manual compression alone (n=20) (level III-3 intervention evidence). The majority of donors in the mechanical resuscitation group were male (95%) with a mean age of 39 ± 10 years. The manual group had similar characteristics (85% male, mean age 41 ± 9 years).

There was no statistical difference in the mean time to arrival of the emergency services to the scene of cardiac arrest between the patients who underwent manual or mechanical resuscitation (15 ± 7 vs 12 ± 8 minutes) or between the time when emergency services were contacted and arrival at the hospital (99 ± 24 vs 97 ± 53 minutes). In the manual compression group a total of 33 out of a potential 40 kidneys (82.5%) were transplanted. Reasons for exclusion in this group were not stated. In the mechanical compression group a total of 39 out of a potential 56 kidneys (69.6%) were transplanted. Reasons for exclusion in this group included legal objection (n=1), next of kin refusal (n=3), failure to establish extracorporeal circulation (n=1) and non-viable kidneys (n=7). There was no difference in the number of primary graft failures between the two groups with three (9.1%) and two (5.1%) failures in the manual and mechanical compression groups, respectively (Mateos-Rodriguez et al 2010).

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[1] Creatinine is a breakdown product from muscle which is primarily filtered out of the blood by the kidneys and therefore measuring creatinine levels is an important measure of kidney function. Males tend to have higher levels of creatinine than females due to their higher muscle mass. Normal serum creatinine levels are: Male: 60 – 120 μmol/L and female: 40 – 90 μmol/L.

Although no difference in transplantation or graft survival rates were observed with the use of mechanical compression resuscitation, the devices improve brain perfusion and minimise injury to paramedics during emergency transportation. Of interest, is that three individuals were identified as potential NHBDs and mechanical resuscitation was continued longer than the recommended 30 minutes for this reason. These three patients experienced spontaneous circulation and survived. In addition, the authors note that next of kin refusal for organ donation is lower in NHBDs than for heart beating donors. The cause for this difference is unknown but may be related to the short length of time to consider their decision that family members receive in cases of sudden cardiac arrest compared to the lengthy periods of time spent with brain dead donors (Mateos-Rodriguez et al 2010).

The study with the longest follow-up period reported on outcomes of patients transplanted with kidneys from NHBD and heart beating donors (level III-3 intervention evidence). Over an 11 year period, NHBD made up 22 per cent (n=112) of all kidney transplants performed in the study centre. The characteristics of these transplants were matched with recipients who had received a HBD (164 out of a possible 285 HBD transplants). The cold ischaemic time was equivalent for the two groups, however, as would be expected, the warm ischaemic time was significantly longer for the organs from the NHBDs compared to those retrieved from HBD (25 ± 14 vs 0 ± 1 minutes, $p < 0.001$). Although there were more recipients who experienced primary non-function in the NHBD group (6/112, 5.4%) compared to the HBD group (3/164, 1.8%), the difference was not significant ($p=0.164$). A significant number of patients did, however, experience delayed graft function in the NHBD group (94/112, 83.9%) compared to those in the HBD (36/164, 22.0%), $p < 0.001$. Overall serum creatinine levels were significantly higher in NHBD recipients compared to HBD recipients ($p<0.001$). Death-censored graft survival at 10 and 15 years was 61.0 and 44.2 per cent for NHBD, and 71.7 and 58.5 per cent for HBD kidneys. Although the difference between the two groups at 15 years did not reach statistical significance ($p=0.108$), death-censored graft survival was clearly higher for those recipients who received HBD kidneys (Barlow et al 2009).

A study in the Netherlands reported on the use of kidneys retrieved from paediatric NHBDs (de Vries et al 2010). A total of 90 viable kidneys were transplanted into 88 recipients[2] from 49 NHBDs with a mean age 15 years (range 2-17 years) (intervention level IV evidence). The majority of these kidneys (88%) came from donors who were Maastricht category 3 – controlled donors, awaiting cardiac arrest. The mean age of the recipients was 50 ± 15 years.

In the 86 patients where short-term graft function could be assessed, 42 recipients (49%) had immediate function, 38 (44%) had delayed function and required temporary dialysis and six (7%) experienced primary non-function. Of the 11

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[2] Two recipients received both kidneys from a single donor

transplants from donors who experienced uncontrolled deaths (Maastricht category 2), nine experienced delayed graft function and one primary non-function. A logistic regression analysed all the potential donors factors associated with successful or unsuccessful graft function and found that the only factor associated with the poor functioning of grafts was the length of warm ischaemic time. A warm ischaemia time of ≥ 25 minutes was a statistically significant risk factor for primary non-function with an odds ratio of 9.42 (95% CI [1.05, 85.0], $p < 0.05$).

The death-censored graft survival rate was 87 and 80 per cent at one and five-years post-transplantation, respectively, and patient survival was 97 and 88 per cent, respectively for the same time points. The mean glomerular filtration rate for recipients who experienced immediate and delayed graft function equalised after three months (49 ± 17 vs 50 ± 22 ml/min/1.73 m^2, respectively, $p = 0.95$). Graft and patient survival did not differ between those recipients who experienced immediate or delayed graft function. This study indicates that kidneys from paediatric donors can successfully be transplanted into adult recipients (de Vries et al 2010).

*A cohort study published after the completion of this summary reported on the factors that affected the transplantation outcomes of kidneys donated after cardiac death. During the period 2000-2007 there were 9,134 kidney transplants performed in 23 centres in the United Kingdom. Of these kidneys 8,289 were donated after brain death and 845 after *controlled* cardiac death. First-time recipients of kidneys from cardiac-death donors (n=739) or brain-death donors (n=6,759) showed no difference in graft survival up to 5-years (hazard ratio 1·01, 95% CI [0·83, 1·19], $p=0·97$). Although the estimated glomerular filtration rate was poorer at 3-months for recipients of kidneys from cardiac-death donors compared with that in recipients of kidneys from brain-death donors, there was no difference between the two groups at 1-5 years after transplantation (at 12 months -0·36 mL/min per 1·73 m^2, 95% CI [-2·00, 1·27], $p=0·66$). Delayed graft function was increased in kidneys from cardiac-death donors (50%) compared with kidneys from brain-death donors (25%). Graft survival was similar for kidneys from the two donor types up to 5 years after transplantation. For recipients of kidneys from cardiac-death donors, increasing age of donor and recipient, repeat transplantation, and cold ischaemic time of more than 12 hours were associated with worse graft survival; grafts from cardiac-death donors that were poorly matched for HLA had an association with inferior outcome that was not significant, and delayed graft function and warm ischaemic time had no effect on outcome (Summers et al 2010).

COST IMPACT

No cost-effectiveness studies were identified that specifically looked at the use of NHBDs in a transplant program. However, as Fieux et al (2009) reported that the use of NHBD donors resulted in a 10 per cent increase in the kidney transplantation rate over a 17-month period, a cost-effectiveness evaluation would clearly be of benefit.

A 2006 analysis of the economic impact of end-stage renal disease in Australia estimated that hospital based dialysis was the most expensive treatment option at $82,764 unit cost per year per person. In 2008, hospital dialysis was used by 22 per cent of all patients on dialysis (n= 2,213), which would have an estimated yearly cost of $183 million. Satellite haemodialysis had an approximate cost of $48,031 per patient per year and 45 per cent of dialysis patients used this option (n=4,528) at a total cost of $217 million per year. Dialysis costs took into account the cost of equipment, buildings, maintenance, salaries and wages, consumables, revision of access, drugs, complications, and specialist consultations. Transplant costs for the first year of the patient's treatment were comparable to those for dialysis, with transplants from live or deceased donors costing $70,553 and $65,375 per patient per year, respectively. Costs for transplanted patients decreased significantly after the first year to approximately $10,700 per patient per year. Transplant costs included the cost of surgery and hospitalisation, immunosuppressive therapy, specialist review and consultations, and organ donor costs (Cass et al 2006).

A Canadian report estimated that transplanting an individual would result in savings of CAN$104,000 over a 20-year period. (Kanellis 2010).

ETHICAL, CULTURAL OR RELIGIOUS CONSIDERATIONS

There is an ethical imperative to increase the number of potential organs available for donation to patients on the transplantation waiting list. Australia and New Zealand has one of the lowest rates of deceased organ donation of 10 per million in comparison to an international benchmark of 25-35 donors per million (Prakoso et al 2010). It has been postulated that NHBD may be more readily acceptable by individuals who find the concept of brain death difficult to accept. Using non-heart beating donors would increase the number of available organs, however a number of ethical issues are raised. Namely, how long should clinicians wait after cardiac arrest before declaring death and removing organs? In addition, better outcomes for the recipient are achieved if the donor receives anticoagulant, which raises the issue of when is it ethically acceptable to administer anticoagulants to the living donor? Guidelines need to be established to define a "point-of-no return", where the potential donor is still alive but there is no hope of a curative treatment (Zeiler et al 2008).

In addition, the finding by Mateos-Rodriguez et al (2010) that a number of patients went on to survive a cardiac arrest due to their inclusion as a potential donor and resustiation continuing beyond the normal frame raises a number of ethical issues.

Another ethical and access issue which needs to be considered in Australia, is the low number of Aboriginal/Torres Strait Islander patients on the active transplant waiting list (4%), compared to the high numbers of this population affected by end-stage renal disease (ANZDATA 2009).

OTHER ISSUES

No issues were identified/raised in the sources examined.

SUMMARY OF FINDINGS

Australia has one of the lowest rates of organ donation in the world. Kidney transplantation reduces the financial burden on the health system and results in a better quality of life for the patient with end-stage renal disease compared to dialysis. Donation of organs from non-heart beating donors appears to be more acceptable to the next of kin, which may lead to an increase in the number of organ donations. There appears to be little difference in graft and patient survival for patients transplanted with organs from NHBD.

HEALTHPACT ASSESSMENT:

This technology is already being implemented to some degree in Australia, therefore HealthPACT does not intend to further review this technology.

NUMBER OF INCLUDED STUDIES

Total number of studies   4
Level IV intervention evidence   2
Level III-3 intervention evidence 2

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SEARCH CRITERIA TO BE USED:

Death
Delayed Graft Function
Graft Survival
Humans
Kidney Transplantation/ethics/*methods/mortality/pathology/*physiology
Tissue Donors
Tissue and Organ Harvesting
Tissue and Organ Procurement/*ethics/trends
Kidney Failure, Chronic/surgery
Organ Preservation/methods