



Donation after Cardiocirculatory Death: A program that we must implement. Experts Argentinean meeting report

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ABSTRACT

The global organ transplant activity remains satisfying less than 10% of the total number of patients in the waiting list. Brain dead donors and living donors have been the most common source of organs used worldwide. Nevertheless, as part of the different measures and policies implemented to increase donation, the use of donors after cardio-circulatory death (DCD), has been propitiated and expanded in the last couple of years. In Europe and North America, DCD programs had increased the number of available donors in up to 30%; but in many countries, the absence of DCD is mainly due to the lack of laws to legislate the process. We aim to report here the result of legal, ethical, procurement and specific organ working groups which met to assess the current regulatory framework, to evaluate the preliminary local experiences; and to produce a document to inform physicians and the community the current status of this program in our country.

Argentina, a pioneer country in procurement and donation has the regulatory and ethical frameworks to enable the transparent use and access to DCDs', as well as its implantation for organs and tissues in the whole country. In spite of a very preliminary experience, we are proud to present that the process for using DCD has already started. But this novel process requires to be well understood and perceived by the general public and medical community. Education becomes essential.

1. Introduction

The World Health Organization (WHO) through the Global Observatory on Donation and Transplantation (GODT) centralizes the world information on these activities and reports its variations. This information is provided by 82 members of the WHO and represents 74.3% of the world population [1].

The most updated report from 2021, showed that approximately 144,302 solid organ transplants were performed worldwide. That number included 92,532 kidney, 34,694 liver, 8409 heart, 6470 lung, 2025 pancreatic and 172 small bowels transplants. This activity, increased by 11.3% compared to the previous report, but still satisfies less than the 10% of global needs. During this period only 29,611 brain dead donors (BDD) were procured, requiring the use of living donors (LD) in 38% of all kidney and 23% of liver transplants, in order to increase its applicability, and reduce mortality on the waiting list [2].

These numbers clearly show that much remains to be done to satisfy the global and progressively increasing number of people with chronic organ failure. The WHO and The Transplantation Society (TTS) have

asked their member countries to work in order to achieve organ self-sufficiency; that is, to establish the necessary measures and policies to increase organ donation giving priority to the increase of deceased donors but not limiting the increase of the use of LD. In most countries where deceased donation exists, such as ours, it is almost exclusively supported by BDD; but we must remember that the donation after the declaration of death due to cardio-circulatory reasons (DCD), including donors in asystole, has today been redefined as donation of organs in patients who died hospitalized as a result of controlled withdrawal of life-sustaining treatment (RCTSV). Instead, uncontrolled cases are those that arise after failed efforts to resuscitate an individual outside the hospital or while hospitalized that suffered an unexpected cardio-respiratory arrest [3]. The RCTSV occurs after concluding that the continuity of the life-sustaining treatments, will not result in an extension of survival or that the result will be functionally unacceptable in terms of the quality of life expected by the patient or immediate family member.

Although the circumstances described differs according to the country and even to the hospital, only 22 countries of the WHO have

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developed DCD programs. According to the GODT report of 2021, 29,611 (78%) were BDD and 8545 (22%) were DCD, showing an increase of approximately 5.7% compared vs. 2020 [2].

In many cases, the absence of DCD is due to the lack of laws to legislate the process. This could occur when local scientific societies have not developed life support withdrawal guidelines that contemplate it, or because organs obtained from DCD donors could have inferior quality than the ones from BDD, and might impact on short- or long-term results.

These arguments moved us to think why Argentina cannot be the 23rd country within the WHO to offer organs procured from DCD donors to the patients on waiting list?

Our country, a pioneer on setting laws and ethical frameworks on donation and transplantation in the region, has a recently approved new transplant law (Nr: 27.447), that includes the possibility of using DCD organs, being this is an opportunity to expand what is included in the law in order to normalize and execute it.

Our scientific societies, ethicists, lawyers, representatives of the national organ procurement organization as well as specialists from the most experienced centers in the world, were invited to participate of an introductory and educational activity hold at Favaloro's University in November 2021. The aim was to evaluate the current status of DCD use worldwide, to assess the current legal-ethical framework and to review the preliminary local experiences. The working group leaders would later draft in the current document the results of the meeting, aiming to reach out the transplant teams and global community, to provide access to the resulting information, so they can start working on implementing the routine use of DCDs' in Argentina.

Local representatives, and international experts presented the state-of-the-art data, and were divided in working groups for their presentations, generating the following summaries.

2. Ethical and legal framework working group summary

Establishing a DCD program, means going back to the origins, since transplant activity in its early days rely on the use of organs from people who died due to cardio-circulatory arrest. Although the results were not encouraging, they were the basis for the development of the DCD. The evolution of the nomenclature, in Spanish-speaking countries, "Donación en Asistolia", had required the addition of the qualifying adjective of "controlled", since it better summarizes the circumstances involved around that complex process, resulting in "Donación en Asistolia Controlada" or cDCD, which is the most recommended practice worldwide, in contraposition of the uncontrolled ones (uDCD).

This nomenclature is based on the accepted Maastricht classification [4], which considered:

Category	Type	Circumstances
1	Uncontrolled	Dead on arrival
2	Uncontrolled	Unsuccessful resuscitation
3	Controlled	Cardiac arrest follows planned withdrawal of life sustaining treatments
4	Either	Cardiac arrest in a patient who is brain dead

According to this classification, during 2021 91% of the DCD donors were Type 3, 8% Type IV and 1% Type II [2]. For the development of cDCD, it will be necessary to improve the field of therapeutic approach at the end of life. Each professional must be acquainted with the principle of therapeutic proportionality, which occurs when the means used, and the foreseeable end in each patient are assessed, allowing to distinguish between proportionate or disproportionate treatments. In the case of potential cDCD, those are either patients with catastrophic and irreversible neurological injury who do not progress to brain death or, to a lesser extent, those with terminal pathologies [5]. The indication of adequacy of treatment is prior to and independent of the possibility of donation: it is a decision of the treating team (especially the intensive care team) or the anticipated decisions of the patient, or the consent of

the family in case the patient is not able to give it him/herself. It is of good practice that when the indication of adequacy of the therapeutic effort is communicated, it should be done by the treating team, without the participation of any professional related to organ procurement or transplant. This actions have allowed DCD, reaching 35 to 40%, of all deceased donors [6].

The "Institute of Medicine" in 1997 published the first principles for organ transplants from DCDs, establishing the importance of social value in order to increase donation, respecting the values of the donor and their families and the transparency of the process [7]. Subsequently, important concepts were defined, such as the "irreversibility" of the process, the ischemia time that will not impact organ viability, and the "no-touch" period, which is a morally and socially important defense against suspicions of possible donor exploitation: vital support is withdrawn according to the donors' wishes (usually reported by their next of kin) and organs are retrieved without undue interference in the process of dying after declaration of death using circulatory criteria (irreversible cessation of circulation). The donor should always be treated as a mean in itself, and the donor's dignity continuously promoted and preserved.

The current legal framework in Argentina encourages the implementation of a donation program in cDCD. The current transplant law states that death can be certified after confirmation of the irreversible cessation of circulatory or brain functions; and that every doctor who certifies the death of a person must initiate the donation process [8].

Patient's Right Law (Nr. 26,742, incorporated into law 26,529), recognizes the right to refuse treatment and the limitation or adaptation of the therapeutic effort when they are disproportionate in relation to the real benefits for the patient. It also incorporates what is known as "dignified death", recognizes the autonomy of the patient's will to accept or reject certain procedures and to be able to, at any time, revoke the expression of the will. In the event of a terminal or irreversible stage, the patient has the right to refuse medical treatment and request the adaptation of the therapeutic effort when these measures are "extraordinary or disproportionate". This right to die with dignity should never be confused with active euthanasia practices [9].

This law introduces the advance directives of the patient that constitutes the declaration of the will in writing, and they are central when defining the wish at the end of the person's life.

Article 59 of the Civil and Commercial Code, clarifies that when the informed consent cannot be provided by the patient, it can be granted by the legal representative, the spouse, the cohabitant, a relative or close friend who accompanies the patient [10].

Life support, in all its variants, excludes the merely biological extension of life; its purpose is to avoid the maintenance of an irreversible state. The adequacy of life support is based on the principle of autonomy of non-maleficence (avoiding futility and therapeutic obstinacy) and patients' right to plan for end-of-life care [11].

The cDCD programs should be part of the comprehensive care protocol at the end of life. All patients for whom, based on good medical practice, life support treatments are appropriate and who meet the criteria for donation should be considered as potential organ and tissue donors.

The regulatory framework in Argentina, would enable the Donation in Asystole of all types of the Maastricht scale and it does not seem necessary to extend it through a legislative sanction. The Law on Donation and Transplantation of Organs and Tissues already granted powers to the INCUCAI (as enforcement authority) to determine new practices or techniques related to the donation and its implantation for organs and tissues in the whole country. It is essential to have a protocol to be able to adapt the therapeutic effort, which must be previously agreed upon, known and put in practice by all professionals in the critical care unit. The decision of the adequacy of the therapeutic effort is independent and precedes the possibility of donation. The development of a consensus protocol developed by the Critical Care Argentine Society (SATI) has recently provided the framework to progress on the definition of the conditions surrounding the adequacy of therapeutic

efforts under irreversible well defined medical situations. Transparency, adequate information, and the confidentiality of the process must always be ensured. No professional with a conflict of interest (who is part of the procurement or transplant team), should participate in the decision of the patient's therapeutic effort.

3. DCD, a source for expanding the organ donor pool, summary of the procurement working group

Solid organ transplantation continues to rise worldwide, according to Global Observatory on Donation and Transplantation (www.transplant-observatory.org) and, in recent years, there has been a sustained increase in the number of liver transplantations with DCDs. A change in donors' characteristics has been observed, for instance, as result of new traffic laws and improvements in cars and motorbikes' safety tools, accidents on public roads have decreased; therefore, donors with brain trauma had been reduced too. Currently, the number of deaths by ACV raised (and so has the donors' age) due to the longer life expectancy and improvement on medical care.

The cDCD occurs in patients who died due to a cardiac arrest as a result of limited life support. It is performed in patients in whom treatment is futile, in whom the injuries are irreversible and catastrophic or in whom the natural evolution of their disease will lead to circulatory arrest.

In cDCD, the ischemia produced after cardiac arrest will result in a series of metabolic changes: on one hand, there will be a dysfunction of the cell membranes with an increase in the activation of proteolytic enzymes and, on the other hand, the depletion of ATP will generate a series of metabolites that lead to cellular and endothelial damage. Vasoconstriction and thrombosis will occur in the microcirculation and endothelial and platelet activation will activate an inflammatory response with the amplification of cell damage and development of necrosis and apoptosis. For these reasons, organ conservation and preservation methods are very important in asystole donors to favor a functional recovery of the organs.

The limitation of the therapeutic effort and the withdrawal of life support can be performed within operating room where, after diagnosing death, hypothermic perfusion and rapid organ removal are performed. Rapid abdominal extraction can be combined with a chest cold infusion for lung extraction.

Ischemic damage predisposes to a higher risk of primary graft failure or delayed onset of function. As a scientific response to minimize it, normothermic regional perfusion (NRP) has evolved and is becoming standard of care, being a better alternative than performing the "super rapid extraction (SRP)". The use of NRP allows us to, once the diagnosis of death has been made, withdraw life support in the ICU, through cannulation of the femoral vessels and connection to an ECMO circuit. The use of NRP for a period of not less than 60 min, and up to 4–6 h is necessary for a functional organ recovery. Femoral cannulation can be performed pre-mortem or after diagnosis of death, depending on local protocols. At the same time, abdominal NRP can be combined with rapid lung extraction. To do this, the thoracic aortic circuit is isolated using an aortic balloon cannula.

In uDCD, patient's death is diagnosed as result of applying the circulatory criteria, and after implementing the international advanced life support (IALS) protocols, with no positive results. Once the treating team announces that there is no other therapeutic alternative, it should be determined if the patient meets the uDCD donor's criteria based on age, history, and duration of events up to that moment. After death is diagnosed, all the manoeuvres aimed at preserving the organs for transplantation began. External chest compressor and mechanical ventilation are restarted, and the donor is heparinized at maximum doses. The preservation and extraction methods used is the SRP: aortic cannulation and systemic cooling and direct in situ perfusion are performed; or in situ perfusion with a triple-lumen, double-balloon aortic catheter; or use of normo-thermic regional perfusion using ECMO

pumps, recirculating the donor's own blood, trying to reduce ischemic damage and also favouring functional recovery of the organs.

Few countries have units for adequate uDCD management and procurement, and should be considered as the second step in a country aiming to promote the use of DCDs, due to the complexity of the described procedure as well as its worst results, when it is not adequately implemented.

Between 1995 and 2011, only 5.4% and 0.9–2.5% of kidney and liver transplantations were performed with DCD respectively. The first experiences were by using uDCD. The great increase in using DCD for both organs started in 2012, when the Royal Decree 1723 was implemented [12]. At present, more than 30% of liver transplantations performed in countries with DCD programs are performed using cDCD's. Since then, DCD has been mainly used for kidney, liver, and progressively lung transplantations, whereas heart transplantation has started being considered, with some initial reports, as well as recent cases of pancreas [13] and a pediatric multi-visceral transplantation performed [Hospital La Paz, Madrid, unpublished]. In countries with evolved cDCD programs, up to 30% of their donors were provided by this mean.

According to the 2021 report by the GODT, last year 12,833 kidney (14%), 3620 liver (10%), 657 lung (10%), 295 heart (4%) and 83 pancreas' (4%) transplants were performed using DCD [2], and in 2022, the first cDCD for a multi visceral transplant was performed in Hospital La Paz [unpublished data].

4. Kidney transplantation working group summary

The clinical use of Kidney transplantation with BDD began in 1965 and with DCD in 1985. The first experiences were using mainly uDCD (Type 2 of the Maastricht classification). The use of Type 3 cDCD, started in 2014. Over the last ten years, it has been observed that the use of Type 2 DCD decreased and the use of cDCD increased, due mainly been as a result of the complex logistics required for type 2 DCD. It has been reported at the GODT that in 2021 there have been 232 kidney transplantations performed with uDCD, and 290 with cDCDs'.

There are clinical differences between uDCD and cDCDs: usually, the first ones are younger donors with a delayed graft function (DGF) that reaches 60–80% and last longer (2–3 weeks). For cDCD's, in spite of the older age and having more comorbidities, DGF is similar to that of kidney transplantations performed with BDD. However, the donors' age can have an impact on the long-term functionality of the graft.

Taking into account that DCDs are marginal donors, selection and management should be optimized.

In case of kidney transplantation with DCD, some characteristics of the donors should be taken into account. For example, donors' age is considered acceptable up to 85 years when we only kidneys will be harvested; but only up to 65 years if liver extraction is also considered. The functional warm ischemia time (interval from removal from cold storage to establishment of reperfusion of the graft) when only kidney is harvested can be up to 90 min; while when liver is procured, it can only be up to 30 min.

Regarding harvesting, it can be carried out with super-rapid technique or using NRP. In a recent publication comparing both methods in 88 kidney transplantations performed with grafts obtained from cDCD, the incidence of primary dysfunction and DGF were comparable [14].

The results of kidneys transplanted with DCD and NRP compared to BDD donors, found no significant differences regarding graft function and survival at 10 years, while the need for hemodialysis and hospital stay were lower, but not statistically significant. It was observed that creatinine values 1 year after transplantation were better in recipients who underwent harvesting with NRP, but graft survival at two years was higher than 94% for both techniques. At the same time, the glomerular filtration rate (GFR) at 1 and 2 years were significantly higher in grafts from donors in NRP [15,16]

Unlike liver transplantation, the use of hypothermic ex-situ perfusion pumps, is widely used in kidney transplantation, including organs from

DCDs. Analyzing the ex-situ renal perfusion values and results, a renal viability predictive system was developed, with the final renal resistance index as a determining factor of renal function with a GFR less than 30 ml/minute at 6 months. The cut-off value of the resistance index is 0.3, with a prevalence of poor GFR of 15% below 0.3, while it is 100% above this value, with a sensitivity of 80% and a specificity 100% [17].

The results of kidney transplantation with cDCD in Spain, as an example of a country with well-established DCD programs, has allowed to increase the number of transplants by 40%. Functional warm ischemia times were shorter in NRP donors, because cannulation it is performed pre-mortem (13 min vs 18 min). No differences were observed in Primary non-function (PNF) and renal function at one year, while the delay in initial function was lower in NRP compared to super rapid extraction (30.3% vs 48.4%). The same applies for creatinine values at one year (1.5 mg/dl vs. 1.8 mg/dl). The use of ex-situ hypothermic perfusion reduced the need for dialysis in the first week after transplantation, hospital stay, PNF, and the renal discard rate in DCD older than 55 years, improving survival and GFR per year [18].

The overall initial non-function when BDD was used was 3.1%, in case of uDCD: 10.1%, but in case was cDCD 3.9% and the DGF was 18%, 62.9% and 29.6% respectively. Duration of DGF was longer in uDCD: 17 days, while 2.9 days in BDD and 11 days in cDCD. The incidence of acute cellular rejection were: 16%, 10.7% and 9.9% whereas the humoral rejection rates were 3.3%, 3.9% and 4% respectively.

In the current clinical practice, the elected induction therapy varies when DCD or BDD are accepted. In DCD, antithymocyte globulin is the preferred therapy in more than 80–90% of the recipients; whereas in BDD it is used only in 30%, and Basiliximab has been used in 40% of the cases, with no induction therapy in 30%. Maintenance immunosuppression therapy as of 2013, was mostly based on a calcineurin inhibitor (CNIs) while a mechanistic target of rapamycin (m-TOR) is left as a second agent in BDD. On the contrary, m-TOR has become the preferred agent for uDCD and CNIs are used in cDCD.

In conclusion, the outcomes of kidney transplantation with cDCD offer similar results to those obtained with BDD. The uDCD have higher incidence of primary dysfunction and DGF but no effect on long-term renal function or patient survival. NRP could improve kidney function and reduce DGF.

Once the ethical dilemmas have been overcome and the protocols for limiting life support have been implemented, the ideal would be to start performing transplantation with cDCD, since its logistics is simpler than for uDCD. In Argentina, up to this event, the use of 3 cDCDs were reported. Nevertheless, an update on these number at the time of the submission of the current report has shown an increase on the number to 13 cDCD cases: 7 of them in 2022, resulting in the use of 15 kidneys [Data presented at the closing session of the SAT, December 2022]. Moreover, in December 2022, an ex-situ kidney perfusion pump experience become available for the first time in our country, and its use led by the Hospital Argerich Kidney Transplant Program and INCUCAI.

5. Liver transplantation working group summary

Since mid-1990s, the research and experimental team of the Clinic Hospital in Barcelona demonstrated that NRP exerted an ischemic preconditioning effect, reducing ATP degradation metabolites and reducing hepatocellular and sinusoidal damage, improving hypo-perfusion and organ congestion [19,20].

Through their experience using NRP in DCDs', they established a series of selection criteria depending on which stage the organ is: during the period of connecting it to the pump, time (<4 h), flow (>1.7 L/min) and resistance values, as well as the laboratory data regarding the transaminase levels at the beginning and at the end of preservation (transaminases <x3 and <x4, respectively), were considered. Indirectly, the viability of the organs can be extrapolated to the kidneys of the same donor. Finally, the macroscopic evaluation by the surgeon was considered as the decisive factor in the acceptance of this type of organs [21].

Regarding the results of liver transplant (LT) with uDCD by comparing viable vs non-viable organs, it was observed that in the first group the mean age (47 vs 51 years) and the BMI were lower (mean 24.6 vs 27.1) and the values of transaminases at the start and end of maintenance were significantly less (AST/ALT 52/52 vs 95/103 and 184/149 vs 288/292, respectively). Graft and patient survival rates compared with BDD transplant patients, were lower, with significantly lower graft survival rates with PNF values close to 20%. At the same time, a greater number of transfusions were reported at the time of transplantation, together with similar levels of transaminases at the 7th and 30th day post LT, a higher number of re-transplants (increasing from 4.5% to 12%) and a higher number of biliary complications, increasing from 10.6% to 30.6% [22]. In 2019 A. Hesseimer et al. published the Spanish experience in liver transplantation with DCD; it was an observational study, between June 2012 and December 2016. Results of liver transplantation using cDCD were compared considering the technique used with the donors (super-rapid extraction vs NRP); significant differences in biliary complications, ischemic biliary injuries, and graft losses favor the use of NRP [23].

In Alicante Hospital, there were 34 liver transplants performed with cDCD. In 11 of them the procurement was with super rapid technique and in 23 NRP was used. The mean age of the donors was higher in NRP (58 vs 48 years). There was only 1 re-transplantation due to arterial thrombosis and no graft loss due to ischemic biliary lesions. There was no significant difference in the survival rate. More than half of the patients transplanted with DCD were discharged before the 5th post-operative day. Currently, hepatic artery thrombosis, biliary complications, graft loss, and re-transplantation rates after liver transplantation using cDCD, as well as patients' death are significantly lower with the use of NRP during organ harvesting. This is also reflected in an increase in patient and graft survival.

The results published by the Spanish National Transplant Organization for all the Spanish groups, comparing the survival rate of uDCD vs. cDCD, show no statistically significant differences. The results were slightly better in uDCD, due to the fact that they were younger and selected under strict inclusion criteria [24].

Comparison of LT using cDCD with super rapid extraction vs NRP in Spain, showed no differences in the characteristics of the donor, but in terms of total and functional warm ischemia time, both were lower in the NRP group (23.1 min vs 19.2 min, and 16.1 min vs 13.3 min, respectively). Regarding the post-transplant results, no differences were observed in PNF, re-transplantation rate or patient survival. Nevertheless, there was a higher number of biliary complications and graft loss in favor of the RPN (31% to 8% and 24% to 12%, respectively). Liver graft survival at 2 and 3 years was statistically higher in organs preserved under normothermia [25].

Analyzing the results of the Edinburgh transplant group, patients transplanted with livers in NRP presented lower transaminase peaks (mean ALT first 7th days 633 vs 1154), less PNF (12% vs 32%, a smaller number of anastomotic stenoses (7% vs 27%) and ischemic cholangiopathy (0% vs 27%), with statistical significance compared to the SRP technique, and a trend of survival at 90 days from 90% to 97%. Graft survival was higher in NRP [26].

In Argentina, the use of liver grafts from cDCD is anecdotic and under registered, because they have been procured in cases when asystole occurs while the donor is being transferred to the operating room or during the procurement and fulfilled only if the recipient required an urgent liver transplant or otherwise discarded. There has been no NRP, nor ex-situ machine perfusion use up to date.

6. Results on lung and heart transplant working group

As an update of the current results for lung transplantation with cDCD, the report done by the International Society for Heart and Lung Transplantation, showed a total of 1090 lung transplants performed, with a warm ischemia time of 32 min, mean donor age of 46 years

(34–45); 88,3% of them, transplants were bilateral. Graft survival at 5 years was not significantly different from BDD transplants ($p = 0.72$) [27]. At the same time, no differences were observed in the results of using lungs from combined abdominal donors procured with the SRP vs NRP [28]. The rate of effectiveness and generation of organs in cDCD is very similar to that obtained in BDD, while for uDCDs the rate of organ generation is lower, due to the fact that ischemic damage is severe. The one-year survival in lung transplants do not present differences in comparison to BDD transplants.

Heart transplantation using DCD is a rapidly expanding practice. There are now at least three protocols that allow resuscitation and viability assessment of the DCD heart either in situ or ex situ: Direct procurement followed by normothermic machine perfusion (DP-NMP), normothermic regional perfusion followed by normothermic machine perfusion (NRP-NMP) and normothermic regional perfusion followed by static cold storage (NRP-SCS).

While the retrieval protocol for hearts from DCD donors will depend on local regulations, the outcomes of DCD heart transplant recipients reported to date are excellent regardless of the retrieval protocol and are comparable to the outcomes of heart transplant recipients from BDD donors. In the two centers with the largest published experience, DCD heart transplantation now accounts for one third of their heart transplant activity. With international trends indicating that there is an increasing utilization of the DCD pathway, it is expected that DCD donors will become a major source of heart donation worldwide [29,30]. In Argentina, cDCD has not been accepted for clinical purposes for intra-thoracic transplants up to date.

7. Summary and conclusions

The background included in this manuscript resulting of this scientific activity summarizes the current worldwide encouraging experience of using DCD and in particular cDCD. We pretend by generating this document to have it available to be used as a start-up or a call to action working document, understanding that cDCD programs remain inadequately developed by most countries independently of the degree of economic development [31]. Our country once again is pioneering this effort in the region, in order to find new sources to increase donation aiming to better serve patients on the waiting list and trying to become self-sufficient as it has been required by the WHO. That process requires to be started by establishing the adequate legal framework; in order to guarantee to our community transparency and access to the appropriate regulatory frameworks for the whole process, including the capacity for oversight the new practice [30,31]. To educate the medical community regarding the ethical principles of considering the possibility of a potential cDCD, only after the decision of withdrawing support as an end-of-life measure is mandatory in order for the process to succeed, might be the second recommended step. In countries like ours, a challenge might be the ICU resources, but the health system should recognize it as an investment to be made, because by increasing transplantation a significant reduction in costs occur by reducing the costs assigned to dialysis and other supportive measures of terminal organ failure.

The permanent cessation of blood perfusion to the brain is the standard to determine death by circulatory criteria. Death may be declared after an elapsed observation period of 5 min without circulation to the brain, which confirms that the absence of circulation to the brain is definitive. Retrieval of cDCD, should be follow a well described and established process: it should be start with procurement of kidney and liver grafts, and by performing the super-rapid technique, until NRP or ex-vivo perfusion devices become available nationwide. By increasing the number of potential donors, the whole system will benefit by increasing transplant applicability, by reducing the need for using living donors and by avoiding practices like transplant tourism, that violate fundamental human values and pose risk to individuals and public health. Finally, we need to be sure that this novel process is well understood and perceived by the general public, education becomes

essential as we must introduce a different concept in terms of how death is determined (DCD) after we have invested years in teaching about BDD. Religious leaders might be of help during this process since both practices are supported by most religions [31].

In Argentina the process has been started: we need now to increase the practice.

Declaration of Interests

All the authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Our acknowledgement to all professionals that were present at this educational event, in alphabetic order and by working group:

Ethical and Legal Framework working group: Barone María, Cabezas Viviana, Cambariere Roberto, Fontana Roxana, Magnante Dinah, Pregno Elián, Raimondi Clemente, Reina Rosa, Salome Mariela, Schiavelli Rubén, Tanus Eduardo, Tarditti Adrián, Villavicencio Santiago, Yankowski Alejandro.

Procurement working group: Barone María, Bauqué Susana, Bisignano Liliiana, Bustos José Luis, Cabezas Viviana, Fontana Roxana, Hidalgo Gabriela, Juri José, Sanchez Nicolás.

International Experts: D'Amico Francesco, Manyalich Martí, Oppenheimer Federico Ruiz Ángel, Rodriguez-Laiz Gonzalo.

Abdominal organs transplantation working group: Lendoire Javier, Mangus Richard, Maraschio Martin, Mattera Juan, Matus Daniel, Ramisch Diego.

Heart and lung transplantation working group: Belforte Sandro, Bertolotti Alejandro, Beveraggi Enrique, Burgos Claudio, Candiotti Mariano, Honorato, Rolando, Vrancic Mariano.

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