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Document Report – Grouped by: Document Groups

All (20) documents

Groupless

20 Documents:

2 Organ Donor Problems

11 Codes:

● Conditions

21 Quotations:

2:13 Any comatose patient with a known aetiology of irreversible cerebral..... (2:139 [2:980]) - D 2: Organ Donor Problems

Any comatose patient with a known aetiology of irreversible cerebral damage who is likely to progress to brain death prior to terminal circulatory arrest, should be considered a potential organ donor. The absolute contraindications are: • Uncontrolled sepsis • Active viral infection - Hepatitis B and C, CMV, Herpes simplex • HIV-positive serology • Malignancy (except primary intracranial tumor, non melanotic skin cancer and Ca-cervix in situ) Ideally, the donor should be less than 60 years of age, without end organ damage from systemic disease, but these criteria have been liberalized, considering organ shortage.[6] Besides these general criteria, it is important to determine the intrinsic function of the organs to be transplanted and to ascertain that the illness has not impaired these organs irreversibly.

2:14 Brain death is a catastrophic physiological event, associated with si..... (2:1013 [2:1482]) - D 2: Organ Donor Problems

Brain death is a catastrophic physiological event, associated with significant deterioration in the function of the organs distant from the brain. These changes occur due to the process of brain dying, as well as due to loss of integrated neurological function, with its central role in the coordination of autonomic and other basic organ functions. Even with maximal support, cardio-respiratory deterioration leading to somatic death will occur within days.[7,8]

2:15 The most important goals in the management of brain dead organ donors..... (2:2343 [2:2695]) - D 2: Organ Donor Problems

The most important goals in the management of brain dead organ donors are: hemodynamic stability and support of body homeostasis until the organs are retrieved. There is a shift in emphasis from cerebral protection with its usual accompaniment of intravascular volume depletion, to the optimization of organ perfusion and tissue oxygen delivery.

2:16 Regular nursing care must be continued after brain death. Frequent tu..... (2:2725 [2:3615]) - D 2: Organ Donor Problems

Regular nursing care must be continued after brain death. Frequent turning of patient for decubitus ulcer prophylaxis, skin care, dressing changes, urinary and intravascular catheter care, must be meticulous to minimize the risk of infection. A nasogastric tube must be inserted for gastric decompression and prevention of aspiration. If necessary, arterial and central venous lines should be inserted into the upper extremities, because femoral line readings can become inaccurate during surgical procedure for organ procurement.[11] Routine monitoring includes ECG, blood pressure, pulse oximetry, core temperature, U/O and central venous pressure. Use of a Swan-Ganz catheter for measurement of pulmonary capillary wedge pressure and pulmonary venous oxymetry, should be reserved for unstable donors, who have persistent acidosis with evidence of tissue hypoperfusion.[12]

2:21 Hypotension is the most common hemodynamic abnormality observed in up..... (2:4204 [2:4460]) - D 2: Organ Donor Problems

Hypotension is the most common hemodynamic abnormality observed in upto 91% of brain-dead organ donors.[14] The contributing factors are multifactorial and include hypovolaemia, damage to vasomotor centre, left heart dysfunction and endocrine failure.

2:29 After brain death is declared, vigorous tracheobronchial toilet is im..... (3:2977 [3:3230]) - D 2: Organ Donor Problems

After brain death is declared, vigorous tracheobronchial toilet is important with frequent suctioning, using sterile precautions. The lungs must be inflated by manual inflation at regular intervals, to minimize the risk of atelectasis and infection.

2:30 Brain dead donors can develop respiratory alkalosis secondary to mech..... (3:4038 [3:4570]) - D 2: Organ Donor Problems

Brain dead donors can develop respiratory alkalosis secondary to mechanical hyperventilation as a part of treatment protocol for elevated intracranial pressure, or lactic metabolic acidosis due to dehydration or tissue ischaemia. Both have deleterious effect on tissue oxygen delivery; hence, arterial pH should be adjusted to normal values. Treatment is first directed towards correcting cause, changing ventilatory parameters and finally pharmacological agents are administered to correct the calculated acid-base deficit.

2:31 Hyperglycemia in brain-dead donors may be due to stress, catecholamin..... (4:1873 [4:2146]) - D 2: Organ Donor Problems

Hyperglycemia in brain-dead donors may be due to stress, catecholamine-induced insulin resistance, steroid administration for treatment of cerebral edema, or infusion of large amounts of dextrose-containing IV fluids.

There is no evidence of pancreatic endocrine failure

2:32 After brain death, the body becomes poikilothermic, because of loss o..... (4:3050 [4:3404]) - D 2: Organ Donor Problems

After brain death, the body becomes poikilothermic, because of loss of thalamic and hypothalamic central temperature control mechanisms. Systemic vasodilatation, administration of cold IV fluids and blood products, will further aggravate the problem. Hypothermia can lead to cardiac irritability, coagulopathy and reduce oxygen delivery to tissues. I

2:33 Coagulopathy and disseminated intravascular coagulation are not uncom..... (4:3675 [4:4016]) - D 2: Organ Donor Problems

Coagulopathy and disseminated intravascular coagulation are not uncommon findings in brain-dead donors, particularly in head injury patients, due to release of thromboplastin from the injured brain.[41,42] Other reasons are dilutional coagulopathy due to large volume resuscitation, massive blood transfusion for trauma, or hypothermia.

2:34 Brain death is also proposed to induce organ dysfunction via ischemia..... (4:4383 [5:240]) - D 2: Organ Donor Problems

Brain death is also proposed to induce organ dysfunction via ischemia reperfusion injury, due to vasoconstriction and low flow associated with autonomic storm, followed by vasodilatation and reflow. Recent studies suggest that there is up-regulation of 32

IJCCM October-December 2003 Vol 7 Issue 4 Indian J Crit Care Med January-March 2006 Vol 10 Issue 1 inflammatory cytokines, increased expression of cell adhesion molecule/antigen and widespread microvascular and endothelial changes.[43,44

2:35 Maintaining adequate systemic perfusion pressure and brisk urine outp..... (4:116 [4:579]) - D 2: Organ Donor Problems

Maintaining adequate systemic perfusion pressure and brisk urine output (>1-2 ml/kg/hr), while minimizing the use of vasopressors, contributes to good renal allograft function.[12] If urine output is less (<1 ml/kg/hr) after adequate volume loading, loop diuretics (furosemide), or osmotic diuretics (mannitol) should be used. Use of nephrotoxic drugs (aminoglycosides) and agents that adversely affect renal perfusion (e.g. NSAIDs), should be avoided.[12]

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between trans-plant organizations and countries. Cooperation between countries is increasingly important

10:1 Brain Death Brain Death occurs when: 1. The patient is in a state wh..... (1:851 [1:2219]) - D 10: Organ Donation Process

Brain Death Brain Death occurs when: 1. The patient is in a state where they will never wake up.

2. The patient loses all vital functions of the brain, which includes the ability to ever breathe on their own.

Brain death means that a person is dead even though their heart continues to beat and breathing is made possible by use of a breathing tube and a breathing machine. A series of tests are done by two doctors who are experts in the field of brain injury to confirm that the patient is brain dead.

There are times when this series of brain death tests cannot be performed, and a more highly specialized test is needed called a CT Angiogram. A CT Angiogram test looks to see if blood is flowing in the brain. If blood is not flowing in the brain, the person is brain dead.

Brain death may be difficult for family members to understand because their loved one is being supported by machines, and looks as if he/she is asleep. Brain death is not the same as a coma where some brain function is still present.

In the case of brain death, blood is still flowing to other body organs such as the heart, lungs, liver, kidneys, small bowel and pancreas. Once the patient's family makes the final decision to donate, these organs may be transplanted into another person as long as the organs are working properly; and there are no serious health concerns.

10:3 Family Consent Once brain death has happened, the Donor Coordinator w..... (2:791 [2:1433]) - D 10: Organ Donation Process

Family Consent Once brain death has happened, the Donor Coordinator will meet with the family to provide information on organ donation in a sensitive and supportive manner. During the meeting with the family, the patient remains on a breathing machine and can be given medications while the family is making a decision. The decision can be easier and less stressful for the family if they have already talked about organ donation before.

The family may give consent for which organs they wish to donate during this meeting.

Once a decision has been made by the family, then they can go forward and make all of the funeral arrangements.

10:4 Suitability A series of tests and exams are then performed to assess..... (2:1434 [2:2132]) - D 10: Organ Donation Process

Suitability A series of tests and exams are then performed to assess the organs being offered for transplant. These tests and exams determine how stable the donor is, if the organs are working properly, and if there is any risk of diseases being transmitted from the donor to the person receiving the organ. Even if the organs were healthy and strong in life, the process of brain death can cause injury to the organs, which can make them unfit for transplant.

To ensure the health and safety of the person receiving the organ (recipient), a review of the donor's medical and social history is carried out with the family using a detailed questionnaire. The questions asked are similar to the

10:5 Organ Placement Donated organs are matched to recipients based on: bl..... (2:2244 [2:2775]) - D 10: Organ Donation Process

Organ Placement Donated organs are matched to recipients based on: blood type, height, weight, and how sick the recipient is, and how long they have been waiting for a transplant. The most suitable recipient for each organ is identified before that organ is removed, because organs cannot be stored for long periods of time outside the body. Finally, for the best match of an organ to a recipient, a special blood test called HLA typing (DNA/ genetic test) is done to see which recipient would have the least chance of rejection

10:6 Organ Recovery The donor is taken to the operating room once all of t..... (2:2898 [2:3197]) - D 10: Organ Donation Process

Organ Recovery The donor is taken to the operating room once all of the tests are completed, recipients have been chosen, and the transplant teams are assembled. The donor surgery takes place in the same manner as any other surgery. The donor's organs are removed and transplanted without delay.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

12/19/2019 Matching Donors and Recipients | Organ Donor

<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6

expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Cost

1 Quotations:

2:3 high costs (1:1563 [1:1574]) - D 2: Organ Donor Problems

high costs

● Factors

15 Quotations:

2:12 Recognition of Potential Organ Donor (2:101 [2:136]) - D 2: Organ Donor Problems

Recognition of Potential Organ Donor

2:17 Pathophysiology of Brain Death (2:981 [2:1010]) - D 2: Organ Donor Problems

Pathophysiology of Brain Death

2:18 Intensive Care Management (2:2316 [2:2340]) - D 2: Organ Donor Problems

Intensive Care Management

2:19 Routine Care and Monitoring (2:2696 [2:2722]) - D 2: Organ Donor Problems

Routine Care and Monitoring

2:20 Cardiovascular Support (2:4180 [2:4201]) - D 2: Organ Donor Problems

Cardiovascular Support

2:22 Ventilatory Support (3:2956 [3:2974]) - D 2: Organ Donor Problems

Ventilatory Support

2:23 Renal Support (4:101 [4:113]) - D 2: Organ Donor Problems

Renal Support

2:24 Temperature Regulation (4:3026 [4:3047]) - D 2: Organ Donor Problems

Temperature Regulation

2:25 Coagulation System (4:3655 [4:3672]) - D 2: Organ Donor Problems

Coagulation System

2:26 Endocrine Dysfunction (4:582 [4:602]) - D 2: Organ Donor Problems

Endocrine Dysfunction

2:27 Ischaemia-Reperfusion Injury (4:4353 [4:4380]) - D 2: Organ Donor Problems

Ischaemia-Reperfusion Injury

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

12/19/2019 Matching Donors and Recipients | Organ Donor

<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer

than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

17:2 1. Positive attitude of public towards organ donation 2. Consent by r..... (1:541 [1:880]) - D 17: Cadaver Organ Donation

1. Positive attitude of public towards organ donation 2. Consent by relatives for organ donation in event of brain death.
3. Successful brain Death identification and certification.
4. Adequate hospital infra-structural and support logistics 5. Successful retrieval and transplantation of organs and auditing long term graft outcomes.

20:2 A range of factors influence those allocation decisions—or allocation..... (2:1187 [2:1578]) - D 20: Maximising patient outcomes (IBM)

A range of factors influence those allocation decisions—or allocation schemes, as they're called—every- thing from the age, size, and clinical condition of the donor and recipient to the unique physiology of each organ type. Medical determinants shaping the development of a suc- cessful kidney allocation scheme, for example, are entirely distinct from those of a heart or liver.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

● **Insights**

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the n..... (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequele of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass media..... (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been international..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable..... (1:1761 [1:1943]) - D 12: Deceased organ donation for transplantation

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ tra..... (8:681 [8:929]) - D 12: Deceased organ donation for transplantation

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the countr..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a temper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artiŻci..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artiŻcial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an

incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

○ **Intensivist**

3 Quotations:

2:10 the intensivist can play a very crucial role by converting a potential donor..... (1:3209 [1:3308]) - D 2: Organ Donor Problems

the intensivist can play a very crucial role by converting a potential donor into an actual donor.

10:7 After Organs Have Been Recovered The donor is kept at the hospital until..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● Limitations

3 Quotations:

2:6 lack of well-developed cadaver programme. (1:1688 [1:1729]) - D 2: Organ Donor Problems

lack of well-developed cadaver programme.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● Opportunity

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has b..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better

health services, a temporary emergency lane has been implemented in organ transplant cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

4:10 Yet, there are many states in India that aren't still equipped to deal..... (2:2007 [2:2175]) - D 4: Green Corridor

Yet, there are many states in India that aren't still equipped to deal with "Green Corridors". But that could hopefully change as more and more awareness is created.

8:5 severe organ shortage represents a universal challenge in organ trans..... (2:2523 [2:2681]) - D 8: Strategies to optimize deceased organ donation

severe organ shortage represents a universal challenge in organ transplantation, which should be faced under the scope of a planned and integrated approach.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:10 3.1. Transplant coordination network (5:2100 [5:2135]) - D 8: Strategies to optimize deceased organ donation

3.1. Transplant coordination network

8:11 3.2. Special profile of the 3 levels of transplant coordination (6:1529 [6:1591]) - D 8: Strategies to optimize deceased organ donation

3.2. Special profile of the 3 levels of transplant coordination

8:12 3.3. Continuous audit on brain deaths and outcome of donation at ICUs (6:3643 [6:3712]) - D 8: Strategies to optimize deceased organ donation

3.3. Continuous audit on brain deaths and outcome of donation at ICUs

8:14 Organization is in fact the whole philosophy of what it has been inte..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to efectively combat organ trafcking there is need to increas..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to efectively combat organ trafcking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classifcation and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

● **Problems/Issues**

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

non-availability of a suitable donor

2:11 the aim of this review to provide insight into problems of brain dead..... (1:3317 [1:3446]) - D 2: Organ Donor Problems

the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

3:2 Lack of effective communication An educated donor who is willing to d..... (2:2606 [2:3202]) - D 3: Deceased organ donation

Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

3:3 Lack of organizational support The lack of an adequate number of tran..... (2:3203 [2:4064]) - D 3: Deceased organ donation

Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated and well-versed with the procedures required to conduct an organ donation

program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

4:1 India's traf problem over the years has been the root cause of many d..... (1:1903 [1:2133]) - D 4: Green Corridor

India's traf problem over the years has been the root cause of many deaths. During an medical emer- gency like organ transplantaton over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

4:3 there is a massive lack of awareness about Green Corridor as well as r..... (1:3729 [1:3920]) - D 4: Green Corridor

there is a massive lack of awareness about Green Corridor as well as reluctance for organ dona- ton. Therefore, awareness should be created on a large scale so that no person is lef oblivious

4:4 India's traf problem has ofen been the cause for many deaths, nearly..... (1:904 [1:1179]) - D 4: Green Corridor

India's traf problem has ofen been the cause for many deaths, nearly 1,50,785 persons were killed in 2016 as against 1,46,133 in 2015 only because ambu- lances couldn't get patents to hospital in tme or worse, ambulances weren't able to reach the accident spots on tme.

4:5 The same applies to organ transplants - hearts and other organs from..... (1:1183 [1:1490]) - D 4: Green Corridor

The same applies to organ transplants - hearts and other organs from brain dead patents sometmes have to be transported over long distances and ofen from other cites. Getng them to patent who needs them in tme is vital for survival. India's overcrowded roads are unsuitable for medical emer- gencies.

8:1 Although the number of patients in the waiting list increases over ti..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, na..... (1:2351 [1:2595]) - D 9: Organ donation/transplant rates

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh..... (5:3915 [5:4054]) - D 9: Organ donation/transplant rates

Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the shortage..... (1:1483 [1:1631]) - D 12: Deceased organ donation for transplantation

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait-list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for tr..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant p..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

● **Process**

12 Quotations:

2:9 Successful Organ Donation Requires • Identification of potential organ..... (1:2789 [1:3051]) - D 2: Organ Donor Problems

Successful Organ Donation Requires • Identification of potential organ donor • Determination and certification of brain death • Consent to organ donation from the family • Diagnosis and management of organ donor problems • Organ retrieval and transplantation

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and

maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between trans-plant organizations and countries. Cooperation between countries is increasingly important

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become

more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

15:1 Registering as a Donor The process of donation most often begins with..... (1:616 [1:973]) - D 15: The Deceased Donation Process

Registering as a Donor The process of donation most often begins with your consent to be a donor by registering in your state. Signing up does not guarantee you will be able to donate your organs, eyes, or tissues—and registering usually takes place many years before donation becomes possible. But it is the first step to being eligible to save lives.

15:2 Medical Care of Potential Donors For someone to become a deceased don..... (1:1019 [2:354]) - D 15: The Deceased Donation Process

Medical Care of Potential Donors For someone to become a deceased donor, he or she has to die in very specific circumstances. Most often, a patient comes to a hospital because of illness or accident, such as a severe head trauma, a brain aneurysm (/about/facts- □ □

12/19/2019 The Deceased Donation Process | Organ Donor
<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse> 2/6 terms/terms.html#a) or stroke.

The patient is put on artificial or mechanical support, which keeps blood with oxygen flowing to the organs. The medical team does everything possible to save the patient's life. At

15:3 Brain Death Testing Even though the medical team members do everything..... (2:436 [2:915]) - D 15: The Deceased Donation Process

Brain Death Testing Even though the medical team members do everything they can to save the patient's life, sometimes the injuries are too severe and the patient dies.

If the patient is dead and is not responding, physicians will perform a series of tests to determine if brain death has occurred. A patient who is brain dead has no brain activity and cannot breathe on his or her own. Brain death is death and it is irreversible. Someone who is brain dead cannot recover.

15:4 The Organ Procurement Organization The hospital notifies the local Org..... (2:1063 [2:1554]) - D 15: The Deceased Donation Process

The Organ Procurement Organization The hospital notifies the local Organ Procurement Organization (OPO) (/about/facts-terms/terms.html#div_3&o) of every patient that has died or is nearing death. This is in keeping with federal regulations.

The hospital gives the OPO information about the deceased patient to confirm whether he or she has the potential to be a donor. If the person could be a candidate for donation, a representative from the OPO travels immediately to the hospital.

15:5 Authorizing Donation The OPO representative searches to see if the deceased..... (2:1618 [2:1986]) - D 15: The Deceased Donation Process

Authorizing Donation The OPO representative searches to see if the deceased is registered as a donor on their state registry. If so, that will serve as legal consent for donation.

If the deceased has not registered, and there was no other legal consent for donation, such as a notation on the driver's license, the OPO will ask the next of kin for authorization.

15:6 The Matching Process If the deceased person's evaluation allows donation..... (3:286 [3:844]) - D 15: The Deceased Donation Process

The Matching Process If the deceased person's evaluation allows donation, the OPO contacts the Organ Procurement and Transplantation Network (OPTN) ([/about/facts-terms/terms.html#div_3&#o](#)).

The OPTN operates the national database of all patients in the U.S. waiting for a transplant. The OPO enters information about the deceased donor into the computer system and the search begins.

The computer system generates a list of patients who match the donor (by organ).

Each available organ is offered to the transplant team of the best-matched patient.

15:7 Recovering and Transporting Organs While the search for matching recipients..... (3:1272 [4:473]) - D 15: The Deceased Donation Process

Recovering and Transporting Organs While the search for matching recipients is under way, the deceased donor's organs are maintained on artificial support. Machines keep blood containing oxygen flowing to the organs. The condition of each organ is carefully monitored by the hospital medical staff and the OPO procurement coordinator.

A transplant surgical team replaces the medical team that treated the patient before death. (The medical team trying to save the patient's life and the transplant team are never the same team.) The surgical team removes the organs and tissues from the donor's body in an operating room. First, organs are recovered, and then additional authorized tissues such as bone, cornea, and skin. All incisions are surgically closed. Organ donation does not interfere with open-casket funerals.

□ □

donation.html#expandcollapse 4/6 Organs remain healthy only for a short period of time after removal from the donor, so minutes count. The OPO representative arranges the transportation of the organs to the hospitals of the intended recipients. Transportation depends on the distance involved, and can include ambulances, helicopters, and commercial airplanes.

15:8 Transplanting the Organs The transplant operation takes place after t..... (4:567 [4:958]) - D 15: The Deceased Donation Process

Transplanting the Organs The transplant operation takes place after the transport team arrives at the hospital with the new organ. The transplant recipient is typically waiting at the hospital and may already be in the operating room awaiting the arrival of the lifesaving organ.

Surgical teams work around the clock as needed to transplant the new organs into the waiting recipients.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations <https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Resources

3 Quotations:

2:4 lack of facilities in government hospitals (1:1585 [1:1627]) - D 2: Organ Donor Problems

lack of facilities in government hospitals

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemen..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transport of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

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that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

○ Statistics

5 Quotations:

2:1 Cadaver donors form the largest pool of organs, approaching 95% and 7..... (1:1225 [1:1334]) - D 2: Organ Donor Problems

Cadaver donors form the largest pool of organs, approaching 95% and 70% in Europe and USA, respectively.[1]

2:7 It is estimated that every year, 3500 kidney transplants are being performed..... (1:2366 [1:2505]) - D 2: Organ Donor Problems

It is estimated that every year, 3500 kidney transplants are being performed in our country, out of which $\leq 2\%$ are from cadaver donors[4]

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplantation from Apollo hospital, Teynampet, Chennai (south) to Frontier life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

9:3 Table 3 Sources of the data for the study (6:1 [6:41]) - D 9: Organ donation/transplant rates

Table 3 Sources of the data for the study

12:18 The potential for donation varies across geographic areas of the United States..... (4:3761 [4:4833]) - D 12: Deceased organ donation for transplantation

The potential for donation varies across geographic areas of the United States with a four-fold difference in eligible death/million population reported to OPTN by OPOs (national mean 31 eligible death/million population, ranging from 15 to 61) based on the existing geographical variability in mortality (91-229 deaths/million population from cerebro-vascular accident and trauma)[2]. Importantly, this study highlighted that the number of eligible deaths is correlated to the number of deaths from cerebro-vascular accidents and trauma in that specific area ($r^2 = 0.79$).

Outside the United States, studies from Europe, Canada and other countries have documented similar findings regarding potential donors. In Belgium, Roels et al[22] found that 57% of deceased potential donors were missed along the process due to non-identification or missed referral or lack of consent. Likewise, a study from Canada based on discharge data submitted to the Hospital Morbidity Database reported that only 1 in 6 potential donors (17%) became actual donor[23].

3 Deceased organ donation

6 Codes:

● Criterion

3 Quotations:

**3:1 There are stringent criteria instituted for the retrieval, preservatio.....
(1:1505 [1:1710]) - D 3: Deceased organ donation**

There are stringent criteria instituted for the retrieval, preservation and transportation of donor organs. This article reviews the ongoing efforts being implemented to encourage organ transplantation.

**8:7 2.1. Donor identification All potential donors should be identified
a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ
donation**

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

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Coordination of retrieval activities is needed to guarantee the success of the process.

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14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6 expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

● Legislation

2 Quotations:

3:7 Legislation Transplantation of Human Organ Bill was introduced in the..... (4:272 [4:841]) - D 3: Deceased organ donation

Legislation Transplantation of Human Organ Bill was introduced in the Lok Sabha on 20th August 1992. Transplantation of Human Organ Act (THOA) was passed in 1994. This is the primary legislation related to organ donation and transplantation in India. Before the introduction of this Act, the regulations for organ donation and transplantation in India were nonexistent and malpractices were rampant. The amendment to the Act was passed by the parliament in 2011, and the rules were notified in 2014 as the Transplantation of Human Organs and Tissue Rules – 2014.[6]

17:1 Transplantation of Human Organ (THO) Act' in 1994, it has been possible..... (1:287 [1:538]) - D 17: Cadaver Organ Donation

Transplantation of Human Organ (THO) Act' in 1994, it has been possible to undertake multi-organ transplant activity from brain dead donors. The required pre-requisite for success of the cadaver program depend on various factors¹⁻³ and these include:

● **Opportunity**

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has been..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplantation cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

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Yet, there are many states in India that aren't still equipped to deal with "Green Corridors". But that could hopefully change as more and more awareness is created.

8:5 severe organ shortage represents a universal challenge in organ trans..... (2:2523 [2:2681]) - D 8: Strategies to optimize deceased organ donation

severe organ shortage represents a universal challenge in organ transplantation, which should be faced under the scope of a planned and integrated approach.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:10 3.1. Transplant coordination network (5:2100 [5:2135]) - D 8: Strategies to optimize deceased organ donation

3.1. Transplant coordination network

8:11 3.2. Special profile of the 3 levels of transplant coordination (6:1529 [6:1591]) - D 8: Strategies to optimize deceased organ donation

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Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to efectively combat organ trafcking there is need to increas..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to efectively combat organ trafcking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

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Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classifcation and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

● **Organization**

1 Quotations:

3:5 NOTTO – National Organ and Tissue Transplant Organization This is a n..... (3:1796 [3:2614]) - D 3: Deceased organ donation

NOTTO – National Organ and Tissue Transplant Organization This is a national level organization set up under the Directorate General of Health Services, Ministry of Health and Family Welfare. The National Human Organ and Tissue Removal and Storage Network is a subdivision of this organization, which was formed as mandated by the Transplantation of Human Organ Act (THOA) amendment in 2011. This is established in Delhi and will gradually expand to involve other states and regions of the country. It functions as an apex center for conducting all India activities related to coordination and networking, for the procurement and distribution of organs and tissues, for maintaining the registry of organs, and for facilitating tissue donation and the transplantation of the harvested organs across the country.

● Problems/Issues

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

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the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

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Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

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Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated

and well-versed with the procedures required to conduct an organ donation program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

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India's traf problem over the years has been the root cause of many deaths. During an medical emer- gency like organ transplantaton over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

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The same applies to organ transplants - hearts and other organs from brain dead patents sometmes have to be transported over long distances and ofen from other cites. Getng them to patent who needs them in tme is vital for survival. India's overcrowded roads are unsuitable for medical emer- gencies.

8:1 Although the number of patients in the waiting list increases over ti..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, na..... (1:2351 [1:2595]) - D 9: Organ donation/transplant rates

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh..... (5:3915 [5:4054]) - D 9: Organ donation/transplant rates

Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the shortage..... (1:1483 [1:1631]) - D 12: Deceased organ donation for transplantation

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait-list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for transplantation..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major limiting factor..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant physicians and patients decide to accept or refuse..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

● **Solution**

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility..... (3:2615 [3:3043]) - D 3: Deceased organ donation

Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.

4:6 GREEN COR- RIDOR is an alternative to emergency lanes being implemented..... (2:127 [2:301]) - D 4: Green Corridor

GREEN COR- RIDOR is an alternative to emergency lanes being implemented to certain extent in India proclaiming the safety of its citizen and provides better health services

12:4 Multiple steps in the process of deceased organ donation can be targeted..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automation..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

4 Green Corridor

7 Codes:

● Green Corridor

5 Quotations:

4:8 The procedure is as follows: 1. When the donor family's consent is co..... (2:712 [2:1371]) - D 4: Green Corridor

The procedure is as follows: 1. When the donor family's consent is confirmed and organs are matched to recipient, the hospital staff gets in touch with police commissioner. This is usually done 2 to 4 hours before the organ is harvested.

2. The traffic police chart the fastest and the most navigable route between the two points.

3. Personnel is placed on different points along the route to blockade the route, manage traffic and make sure that the ambulance does not run into any red light 4. A motorcade of around 4-5 vehicles sets off to the destination. This includes police escorts as well as additional ambulance as a precaution for breakdown.

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplantation from Apollo hospital, Teynampet, Chennai (south) to Frontier life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemented..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transportation of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

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The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

● Opportunity

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has b..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplantation cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

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● **Resources**

3 Quotations:

2:4 lack of facilities in government hospitals (1:1585 [1:1627]) - D 2: Organ Donor Problems

lack of facilities in government hospitals

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemented..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transportation of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached..... (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Solution

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.
fa..... (3:2615 [3:3043]) - D 3: Deceased organ donation

4:6 GREEN CORRIDOR is an alternative to emergency lanes being implemented to certain extent in India proclaiming the safety of its citizen and provides better health services
4:6 GREEN CORRIDOR is an alternative to emergency lanes being im- plemented to certain extent in India proclaiming the safety of its citizen and provides beter health services
pleme..... (2:127 [2:301]) - D 4: Green Corridor

12:4 Multiple steps in the process of deceased organ donation can be targeted..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automation..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

○ **Statistics**

5 Quotations:

2:1 Cadaver donors form the largest pool of organs, approaching 95% and 70%..... (1:1225 [1:1334]) - D 2: Organ Donor Problems

Cadaver donors form the largest pool of organs, approaching 95% and 70% in Europe and USA, respectively.[1]

2:7 It is estimated that every year, 3500 kidney transplants are being performed..... (1:2366 [1:2505]) - D 2: Organ Donor Problems

It is estimated that every year, 3500 kidney transplants are being performed in our country, out of which $\leq 2\%$ are from cadaver donors[4]

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplant from Apollo hospital, Teynampet, Chennai (south) to Fronter life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

9:3 Table 3 Sources of the data for the study (6:1 [6:41]) - D 9: Organ donation/transplant rates

Table 3 Sources of the data for the study

12:18 The potential for donation varies across geographic areas of the Unit..... (4:3761 [4:4833]) - D 12: Deceased organ donation for transplantation

The potential for donation varies across geographic areas of the United States with a four-fold difference in eligible death/million population reported to OPTN by OPOs (national mean 31 eligible death/million population, ranging from 15 to 61) based on the existing geographical variability in mortality (91-229 deaths/ million population from cerebro-vascular accident and trauma)[2]. Importantly, this study highlighted that the number of eligible deaths is correlated to the number of deaths from cerebro-vascular accidents and trauma in that specific area ($r^2 = 0.79$).

Outside the United States, studies from Europe, Canada and other countries have documented similar findings regarding potential donors. In Belgium, Roels et al[22] found that 57% of deceased potential donors were missed along the process due to non-identification or missed referral or lack of consent. Likewise, a study from Canada based on discharge data submitted to the Hospital Morbidity Database reported that only 1 in 6 potential donors (17%) became actual donor[23].

● Time

1 Quotations:

4:12 traffic to avoid any hindrances that could come in the way of an ambulance..... (1:2483 [1:2556]) - D 4: Green Corridor

traffic to avoid any hindrances that could come in the way of an ambulance.

8 Strategies to optimize deceased organ donation

8 Codes:

○ Benchmark

2 Quotations:

8:8 The Spanish Model of Organ Donation: an integrated approach to face o..... (3:2596 [3:2678]) - D 8: Strategies to optimize deceased organ donation

The Spanish Model of Organ Donation: an integrated approach to face organ shortage

17:4 As the cadaver program is still in infancy stage the early results of..... (2:4913 [2:5263]) - D 17: Cadaver Organ Donation

As the cadaver program is still in infancy stage the early results of kidney cadaver transplants are acceptable. Two hospitals (All India Institute of Medical Science, Delhi and Madras Medical Mission, Chennai) are undertaking heart transplants. Only one hospital, Indraprastha Apollo Hospital Delhi is undertaking liver transplants regularly.

● Conditions

21 Quotations:

2:13 Any comatose patient with a known aetiology of irreversible cerebral..... (2:139 [2:980]) - D 2: Organ Donor Problems

Any comatose patient with a known aetiology of irreversible cerebral damage who is likely to progress to brain death prior to terminal circulatory arrest, should be considered a potential organ donor. The absolute contraindications are: • Uncontrolled sepsis • Active viral infection - Hepatitis B and C, CMV, Herpes simplex • HIV-positive serology • Malignancy (except primary intracranial tumor, non melanotic skin cancer and Ca-cervix in situ) Ideally, the donor should be less than 60 years of age, without end organ damage from systemic disease, but these criteria have been liberalized, considering organ shortage.[6] Besides these general criteria, it is important to determine the intrinsic function of the organs to be transplanted and to ascertain that the illness has not impaired these organs irreversibly.

2:14 Brain death is a catastrophic physiological event, associated with si..... (2:1013 [2:1482]) - D 2: Organ Donor Problems

Brain death is a catastrophic physiological event, associated with significant deterioration in the function of the organs distant from the brain. These changes occur due to the process of brain dying, as well as due to loss of integrated neurological function, with its central role in the coordination of autonomic and other basic organ functions. Even with maximal support, cardio-respiratory deterioration leading to somatic death will occur within days.[7,8]

2:15 The most important goals in the management of brain dead organ donors..... (2:2343 [2:2695]) - D 2: Organ Donor Problems

The most important goals in the management of brain dead organ donors are: hemodynamic stability and support of body homeostasis until the organs are retrieved. There is a shift in emphasis from cerebral protection with its usual accompaniment of intravascular volume depletion, to the optimization of organ perfusion and tissue oxygen delivery.

2:16 Regular nursing care must be continued after brain death. Frequent tu..... (2:2725 [2:3615]) - D 2: Organ Donor Problems

Regular nursing care must be continued after brain death. Frequent turning of patient for decubitus ulcer prophylaxis, skin care, dressing changes, urinary and intravascular catheter care, must be meticulous to minimize the risk of infection. A nasogastric tube must be inserted for gastric decompression and prevention of aspiration. If necessary, arterial and central venous lines should be inserted into the upper extremities, because femoral line readings can become inaccurate during surgical procedure for organ procurement.[11] Routine monitoring includes ECG, blood pressure, pulse oximetry, core temperature, U/O and central venous pressure. Use of a Swan-Ganz catheter for measurement of pulmonary capillary wedge pressure and pulmonary venous oxymetry, should be reserved for unstable donors, who have persistent acidosis with evidence of tissue hypoperfusion.[12]

2:21 Hypotension is the most common hemodynamic abnormality observed in up..... (2:4204 [2:4460]) - D 2: Organ Donor Problems

Hypotension is the most common hemodynamic abnormality observed in upto 91% of brain-dead organ donors.[14] The contributing factors are multifactorial and include hypovolaemia, damage to vasomotor centre, left heart dysfunction and endocrine failure.

2:29 After brain death is declared, vigorous tracheobronchial toilet is im..... (3:2977 [3:3230]) - D 2: Organ Donor Problems

After brain death is declared, vigorous tracheobronchial toilet is important with frequent suctioning, using sterile precautions. The lungs must be inflated by manual inflation at regular intervals, to minimize the risk of atelectasis and infection.

2:30 Brain dead donors can develop respiratory alkalosis secondary to mech..... (3:4038 [3:4570]) - D 2: Organ Donor Problems

Brain dead donors can develop respiratory alkalosis secondary to mechanical hyperventilation as a part of treatment protocol for elevated intracranial pressure, or lactic metabolic acidosis due to dehydration or tissue ischaemia. Both have deleterious effect on tissue oxygen delivery; hence, arterial pH should be adjusted to normal values. Treatment is first directed towards correcting cause, changing ventilatory parameters and finally pharmacological agents are administered to correct the calculated acid-base deficit.

2:31 Hyperglycemia in brain-dead donors may be due to stress, catecholamin..... (4:1873 [4:2146]) - D 2: Organ Donor Problems

Hyperglycemia in brain-dead donors may be due to stress, catecholamine-induced insulin resistance, steroid administration for treatment of cerebral edema, or infusion of large amounts of dextrose-containing IV fluids.

There is no evidence of pancreatic endocrine failure

2:32 After brain death, the body becomes poikilothermic, because of loss o..... (4:3050 [4:3404]) - D 2: Organ Donor Problems

After brain death, the body becomes poikilothermic, because of loss of thalamic and hypothalamic central temperature control mechanisms. Systemic vasodilatation, administration of cold IV fluids and blood products, will further aggravate the problem. Hypothermia can lead to cardiac irritability, coagulopathy and reduce oxygen delivery to tissues. I

2:33 Coagulopathy and disseminated intravascular coagulation are not uncom..... (4:3675 [4:4016]) - D 2: Organ Donor Problems

Coagulopathy and disseminated intravascular coagulation are not uncommon findings in brain-dead donors, particularly in head injury patients, due to release of thromboplastin from the injured brain.[41,42] Other reasons are dilutional coagulopathy due to large volume resuscitation, massive blood transfusion for trauma, or hypothermia.

2:34 Brain death is also proposed to induce organ dysfunction via ischemia..... (4:4383 [5:240]) - D 2: Organ Donor Problems

Brain death is also proposed to induce organ dysfunction via ischemia reperfusion injury, due to vasoconstriction and low flow associated with autonomic storm, followed by vasodilatation and reflow. Recent studies suggest that there is up-regulation of 32

IJCCM October-December 2003 Vol 7 Issue 4 Indian J Crit Care Med January-March 2006 Vol 10 Issue 1 inflammatory cytokines, increased expression of cell adhesion molecule/antigen and widespread microvascular and endothelial changes.[43,44

2:35 Maintaining adequate systemic perfusion pressure and brisk urine outp..... (4:116 [4:579]) - D 2: Organ Donor Problems

Maintaining adequate systemic perfusion pressure and brisk urine output (>1-2 ml/kg/hr), while minimizing the use of vasopressors, contributes to good renal allograft function.[12] If urine output is less (<1 ml/kg/hr) after adequate volume loading, loop diuretics (furosemide), or osmotic diuretics (mannitol) should be used. Use of nephrotoxic drugs (aminoglycosides) and agents that adversely affect renal perfusion (e.g. NSAIDs), should be avoided.[12]

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between trans-plant organizations and countries. Cooperation between countries is increasingly important

10:1 Brain Death Brain Death occurs when: 1. The patient is in a state wh..... (1:851 [1:2219]) - D 10: Organ Donation Process

Brain Death Brain Death occurs when: 1. The patient is in a state where they will never wake up.

2. The patient loses all vital functions of the brain, which includes the ability to ever breathe on their own.

Brain death means that a person is dead even though their heart continues to beat and breathing is made possible by use of a breathing tube and a breathing machine. A series of tests are done by two doctors who are experts in the field of brain injury to confirm that the patient is brain dead.

There are times when this series of brain death tests cannot be performed, and a more highly specialized test is needed called a CT Angiogram. A CT Angiogram test looks to see if blood is flowing in the brain. If blood is not flowing in the brain, the person is brain dead.

Brain death may be difficult for family members to understand because their loved one is being supported by machines, and looks as if he/she is asleep. Brain death is not the same as a coma where some brain function is still present.

In the case of brain death, blood is still flowing to other body organs such as the heart, lungs, liver, kidneys, small bowel and pancreas. Once the patient's family makes the final decision to donate, these organs may be transplanted into another person as long as the organs are working properly; and there are no serious health concerns.

10:3 Family Consent Once brain death has happened, the Donor Coordinator w..... (2:791 [2:1433]) - D 10: Organ Donation Process

Family Consent Once brain death has happened, the Donor Coordinator will meet with the family to provide information on organ donation in a sensitive and supportive manner. During the meeting with the family, the patient remains on a breathing machine and can be given medications while the family is making a decision. The decision can be easier and less stressful for the family if they have already talked about organ donation before.

The family may give consent for which organs they wish to donate during this meeting.

Once a decision has been made by the family, then they can go forward and make all of the funeral arrangements.

10:4 Suitability A series of tests and exams are then performed to assess..... (2:1434 [2:2132]) - D 10: Organ Donation Process

Suitability A series of tests and exams are then performed to assess the organs being offered for transplant. These tests and exams determine how stable the donor is, if the organs are working properly, and if there is any risk of diseases being transmitted from the donor to the person receiving the organ. Even if the organs were healthy and strong in life, the process of brain death can cause injury to the organs, which can make them unfit for transplant.

To ensure the health and safety of the person receiving the organ (recipient), a review of the donor's medical and social history is carried out with the family using a detailed questionnaire. The questions asked are similar to the

10:5 Organ Placement Donated organs are matched to recipients based on: bl..... (2:2244 [2:2775]) - D 10: Organ Donation Process

Organ Placement Donated organs are matched to recipients based on: blood type, height, weight, and how sick the recipient is, and how long they have been waiting for a transplant. The most suitable recipient for each organ is identified before that organ is removed, because organs cannot be stored for long periods of time outside the body. Finally, for the best match of an organ to a recipient, a special blood test called HLA typing (DNA/ genetic test) is done to see which recipient would have the least chance of rejection

10:6 Organ Recovery The donor is taken to the operating room once all of t..... (2:2898 [2:3197]) - D 10: Organ Donation Process

Organ Recovery The donor is taken to the operating room once all of the tests are completed, recipients have been chosen, and the transplant teams are assembled. The donor surgery takes place in the same manner as any other surgery. The donor's organs are removed and transplanted without delay.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Criterion

3 Quotations:

3:1 There are stringent criteria instituted for the retrieval, preservatio..... (1:1505 [1:1710]) - D 3: Deceased organ donation

There are stringent criteria instituted for the retrieval, preservation and transportation of donor organs. This article reviews the ongoing efforts being implemented to encourage organ transplantation.

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

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Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between transplant organizations and countries. Cooperation between countries is increasingly important

14:1 When matching organs from deceased donors to patients on the waiting list..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the n..... (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequela of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass media..... (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been international..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable..... (1:1761 [1:1943]) - D 12: Deceased organ donation for transplantation

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ tra..... (8:681 [8:929]) - D 12: Deceased organ donation for transplantation

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the countr..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a temper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical

outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artificial intelligence..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● **Opportunity**

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6] b..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplant cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

4:10 Yet, there are many states in India that aren't still equipped to deal..... (2:2007 [2:2175]) - D 4: Green Corridor

Yet, there are many states in India that aren't still equipped to deal with "Green Corridors". But that could hopefully change as more and more awareness is created.

8:5 severe organ shortage represents a universal challenge in organ trans..... (2:2523 [2:2681]) - D 8: Strategies to optimize deceased organ donation

severe organ shortage represents a universal challenge in organ transplantation, which should be faced under the scope of a planned and integrated approach.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:10 3.1. Transplant coordination network (5:2100 [5:2135]) - D 8: Strategies to optimize deceased organ donation

3.1. Transplant coordination network

8:11 3.2. Special profile of the 3 levels of transplant coordination (6:1529 [6:1591]) - D 8: Strategies to optimize deceased organ donation

3.2. Special profile of the 3 levels of transplant coordination

8:12 3.3. Continuous audit on brain deaths and outcome of donation at ICUs (6:3643 [6:3712]) - D 8: Strategies to optimize deceased organ donation

3.3. Continuous audit on brain deaths and outcome of donation at ICUs

8:14 Organization is in fact the whole philosophy of what it has been inte..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to efectively combat organ trafcking there is need to increas..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to efectively combat organ trafcking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

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[6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

● Problems/Issues

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

non-availability of a suitable donor

2:11 the aim of this review to provide insight into problems of brain dead..... (1:3317 [1:3446]) - D 2: Organ Donor Problems

the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

3:2 Lack of effective communication An educated donor who is willing to d..... (2:2606 [2:3202]) - D 3: Deceased organ donation

Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

3:3 Lack of organizational support The lack of an adequate number of tran..... (2:3203 [2:4064]) - D 3: Deceased organ donation

Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated and well-versed with the procedures required to conduct an organ donation program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the

brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

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India's traf problem over the years has been the root cause of many deaths. During an medical emer- gency like organ transplantaton over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

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India's traf problem has ofen been the cause for many deaths, nearly 1,50,785 persons were killed in 2016 as against 1,46,133 in 2015 only because ambu- lances couldn't get patents to hospital in tme or worse, ambulances weren't able to reach the accident spots on tme.

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The same applies to organ transplants - hearts and other organs from brain dead patents sometimes have to be transported over long distances and ofen from other cites. Getng them to patent who needs them in tme is vital for survival. India's overcrowded roads are unsuitable for medical emer- gencies.

8:1 Although the number of patients in the waiting list increases over ti..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barri..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, na..... (1:2351 [1:2595]) - D 9: Organ donation/transplant rates

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programs Armenia, Azerbaijan, Bangla..... (5:3915 [5:4054]) - D 9: Organ donation/transplant rates

Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the shortage..... (1:1483 [1:1631]) - D 12: Deceased organ donation for transplantation

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait- list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for transplant..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant p..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

● **Process**

12 Quotations:

2:9 Successful Organ Donation Requires • Identification of potential organa..... (1:2789 [1:3051]) - D 2: Organ Donor Problems

Successful Organ Donation Requires • Identification of potential organ donor • Determination and certification of brain death • Consent to organ donation from the family • Diagnosis and management of organ donor problems • Organ retrieval and transplantation

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between transplant organizations and countries. Cooperation between countries is increasingly important

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

12/19/2019 Matching Donors and Recipients | Organ Donor

<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

15:1 Registering as a Donor The process of donation most often begins with..... (1:616 [1:973]) - D 15: The Deceased Donation Process

Registering as a Donor The process of donation most often begins with your consent to be a donor by registering in your state. Signing up does not guarantee you will be able to donate your organs, eyes, or tissues—and registering usually takes place many years before donation becomes possible. But it is the first step to being eligible to save lives.

15:2 Medical Care of Potential Donors For someone to become a deceased donor..... (1:1019 [2:354]) - D 15: The Deceased Donation Process

Medical Care of Potential Donors For someone to become a deceased donor, he or she has to die in very specific circumstances. Most often, a patient comes to a hospital because of illness or accident, such as a severe head trauma, a brain aneurysm (/about/facts- ☐ ☐

12/19/2019 The Deceased Donation Process | Organ Donor
[https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse 2/6 terms/terms.html#a](https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse%206%20terms/terms.html#a)) or stroke.

The patient is put on artificial or mechanical support, which keeps blood with oxygen flowing to the organs. The medical team does everything possible to save the patient's life. At

15:3 Brain Death Testing Even though the medical team members do everything..... (2:436 [2:915]) - D 15: The Deceased Donation Process

Brain Death Testing Even though the medical team members do everything they can to save the patient's life, sometimes the injuries are too severe and the patient dies.

If the patient is dead and is not responding, physicians will perform a series of tests to determine if brain death has occurred. A patient who is brain dead has no brain activity and cannot breathe on his or her own. Brain death is death and it is irreversible. Someone who is brain dead cannot recover.

15:4 The Organ Procurement Organization The hospital notifies the local Org..... (2:1063 [2:1554]) - D 15: The Deceased Donation Process

The Organ Procurement Organization The hospital notifies the local Organ Procurement Organization (OPO) (/about/facts-terms/terms.html#div_3&o) of every patient that has died or is nearing death. This is in keeping with federal regulations.

The hospital gives the OPO information about the deceased patient to confirm whether he or she has the potential to be a donor. If the person could be a candidate for donation, a representative from the OPO travels immediately to the hospital.

15:5 Authorizing Donation The OPO representative searches to see if the de..... (2:1618 [2:1986]) - D 15: The Deceased Donation Process

Authorizing Donation The OPO representative searches to see if the deceased is registered as a donor on their state registry. If so, that will serve as legal consent for donation.

If the deceased has not registered, and there was no other legal consent for donation, such as a notation on the driver's license, the OPO will ask the next of kin for authorization.

15:6 The Matching Process If the deceased person's evaluation allows donation..... (3:286 [3:844]) - D 15: The Deceased Donation Process

The Matching Process If the deceased person's evaluation allows donation, the OPO contacts the Organ Procurement and Transplantation Network (OPTN) ([/about/facts-terms/terms.html#div_3&#o](#)).

The OPTN operates the national database of all patients in the U.S. waiting for a transplant. The OPO enters information about the deceased donor into the computer system and the search begins.

The computer system generates a list of patients who match the donor (by organ).

Each available organ is offered to the transplant team of the best-matched patient.

15:7 Recovering and Transporting Organs While the search for matching recipient..... (3:1272 [4:473]) - D 15: The Deceased Donation Process

Recovering and Transporting Organs While the search for matching recipients is under way, the deceased donor's organs are maintained on artificial support. Machines keep blood containing oxygen flowing to the organs. The condition of each organ is carefully monitored by the hospital medical staff and the OPO procurement coordinator.

A transplant surgical team replaces the medical team that treated the patient before death. (The medical team trying to save the patient's life and the transplant team are never the same team.) The surgical team removes the organs and tissues from the donor's body in an operating room. First, organs are recovered, and then additional authorized tissues such as bone, cornea, and skin. All incisions are surgically closed. Organ donation does not interfere with open-casket funerals.

□ □

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[https://www.organdonor.gov/about/process/deceased-](https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse)

[donation.html#expandcollapse](https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse) 4/6 Organs remain healthy only for a short period of time after removal from the donor, so minutes count. The OPO representative arranges the transportation of the organs to the hospitals of the intended recipients. Transportation depends on the distance involved, and can include ambulances, helicopters, and commercial airplanes.

15:8 Transplanting the Organs The transplant operation takes place after transport..... (4:567 [4:958]) - D 15: The Deceased Donation Process

Transplanting the Organs The transplant operation takes place after the transport team arrives at the hospital with the new organ. The transplant recipient is typically waiting at the hospital and may already be in the operating room awaiting the arrival of the lifesaving organ.

Surgical teams work around the clock as needed to transplant the new organs into the waiting recipients.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

○ Representation

7 Quotations:

8:6 Fig. 1. Steps in the process of donation after brain death. (2:3490 [2:3550]) - D 8: Strategies to optimize deceased organ donation

Fig. 1. Steps in the process of donation after brain death.

8:13 Table 2 Economic framework and resources dedicated to health care in..... (8:4157 [8:4257]) - D 8: Strategies to optimize deceased organ donation

Table 2 Economic framework and resources dedicated to health care in European countries (year 2004)

12:8 Figure 1 The gap between organs needed and organs available continues..... (2:4654 [2:4799]) - D 12: Deceased organ donation for transplantation

Figure 1 The gap between organs needed and organs available continues to grow. Available from: URL: [http://www.organdonor.gov/about/data.](http://www.organdonor.gov/about/data.html)

html.

12:13 BD: Brain death; OPTN: Organ Procurement Transplantation Network. (4:5822 [4:5888]) - D 12: Deceased organ donation for transplantation

BD: Brain death; OPTN: Organ Procurement Transplantation Network.

12:15 Figure 2 The number of actual organ donors is only a small proportion..... (5:3923 [5:4093]) - D 12: Deceased organ donation for transplantation

Figure 2 The number of actual organ donors is only a small proportion of the pool of deaths. A: Total deaths; B: Imminent deaths; C: Eligible deaths; D: Actual donors.

12:16 Figure 3 The process of deceased organ donation. (5:4191 [5:4240]) - D 12: Deceased organ donation for transplantation

Figure 3 The process of deceased organ donation.

24:9 Figure 10. Sequence Diagram for Organ donation system. (15:1825 [15:1878]) - D 24: Blockchain based Organ Transplant Services

Figure 10. Sequence Diagram for Organ donation system.

9 Organ donation/transplant rates

2 Codes:

● Problems/Issues

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8:1 Although the number of patients in the waiting list increases over time..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, na..... (1:2351 [1:2595]) - D 9: Organ donation/transplant rates

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programa Armenia, Azerbaijan, Bangla..... (5:3915 [5:4054]) - D 9: Organ donation/transplant rates

Inactive deceased or living donor programa Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the sho..... (1:1483 [1:1631]) - D 12: Deceased organ donation for transplantation

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait- list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for tr..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant p..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

○ **Statistics**

5 Quotations:

2:1 Cadaver donors form the largest pool of organs, approaching 95% and 7..... (1:1225 [1:1334]) - D 2: Organ Donor Problems

Cadaver donors form the largest pool of organs, approaching 95% and 70% in Europe and USA, respectively.[1]

2:7 It is estimated that every year, 3500 kidney transplants are being pe..... (1:2366 [1:2505]) - D 2: Organ Donor Problems

It is estimated that every year, 3500 kidney transplants are being performed in our country, out of which $\leq 2\%$ are from cadaver donors[4]

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplant from Apollo hospital, Teynampet, Chennai (south) to Fronter life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with co-ordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

9:3 Table 3 Sources of the data for the study (6:1 [6:41]) - D 9: Organ donation/transplant rates

Table 3 Sources of the data for the study

12:18 The potential for donation varies across geographic areas of the Unit..... (4:3761 [4:4833]) - D 12: Deceased organ donation for transplantation

The potential for donation varies across geographic areas of the United States with a four-fold difference in eligible death/million population reported to OPTN by OPOs (national mean 31 eligible death/million population, ranging from 15 to 61) based on the existing geographical variability in mortality (91-229 deaths/ million population from cerebro-vascular accident and trauma)[2]. Importantly, this study highlighted that the number of eligible deaths is correlated to the number of deaths from cerebro-vascular accidents and trauma in that specific area ($r^2 = 0.79$).

Outside the United States, studies from Europe, Canada and other countries have documented similar findings regarding potential donors. In Belgium, Roels et al[22] found that 57% of deceased potential donors were missed along the process due to non-identification or missed referral or lack of consent. Likewise, a study from Canada based on discharge data submitted to the Hospital Morbidity Database reported that only 1 in 6 potential donors (17%) became actual donor[23].

10 Organ Donation Process

3 Codes:

● Conditions

21 Quotations:

2:13 Any comatose patient with a known aetiology of irreversible cerebral..... (2:139 [2:980]) - D 2: Organ Donor Problems

Any comatose patient with a known aetiology of irreversible cerebral damage who is likely to progress to brain death prior to terminal circulatory arrest, should be considered a potential organ donor. The absolute contraindications are: • Uncontrolled sepsis • Active viral infection - Hepatitis B and C, CMV, Herpes simplex • HIV-positive serology • Malignancy (except primary intracranial tumor, non melanotic skin cancer and Ca-cervix in situ) Ideally, the donor should be less than 60 years of age, without end organ damage from systemic disease, but these criteria have been liberalized, considering organ shortage.[6] Besides these general criteria, it is important to determine the intrinsic function of the organs to be transplanted and to ascertain that the illness has not impaired these organs irreversibly.

2:14 Brain death is a catastrophic physiological event, associated with si..... (2:1013 [2:1482]) - D 2: Organ Donor Problems

Brain death is a catastrophic physiological event, associated with significant deterioration in the function of the organs distant from the brain. These changes occur due to the process of brain dying, as well as due to loss of integrated neurological function, with its central role in the coordination of autonomic and other basic organ functions. Even with maximal support, cardio-respiratory deterioration leading to somatic death will occur within days.[7,8]

2:15 The most important goals in the management of brain dead organ donors..... (2:2343 [2:2695]) - D 2: Organ Donor Problems

The most important goals in the management of brain dead organ donors are: hemodynamic stability and support of body homeostasis until the organs are retrieved. There is a shift in emphasis from cerebral protection with its usual accompaniment of intravascular volume depletion, to the optimization of organ perfusion and tissue oxygen delivery.

2:16 Regular nursing care must be continued after brain death. Frequent tu..... (2:2725 [2:3615]) - D 2: Organ Donor Problems

Regular nursing care must be continued after brain death. Frequent turning of patient for decubitus ulcer prophylaxis, skin care, dressing changes, urinary and intravascular catheter care, must be meticulous to minimize the risk of infection. A nasogastric tube must be inserted for gastric decompression and prevention of aspiration. If necessary, arterial and central venous lines should be inserted into the upper extremities, because femoral line readings can become inaccurate during surgical procedure for organ procurement.[11] Routine monitoring includes ECG, blood pressure, pulse oximetry, core temperature, U/O and central venous pressure. Use of a Swan-Ganz catheter for measurement of pulmonary capillary wedge pressure and pulmonary venous oxymetry, should be reserved for unstable donors, who have persistent acidosis with evidence of tissue hypoperfusion.[12]

2:21 Hypotension is the most common hemodynamic abnormality observed in up..... (2:4204 [2:4460]) - D 2: Organ Donor Problems

Hypotension is the most common hemodynamic abnormality observed in upto 91% of brain-dead organ donors.[14] The contributing factors are multifactorial and include hypovolaemia, damage to vasomotor centre, left heart dysfunction and endocrine failure.

2:29 After brain death is declared, vigorous tracheobronchial toilet is im..... (3:2977 [3:3230]) - D 2: Organ Donor Problems

After brain death is declared, vigorous tracheobronchial toilet is important with frequent suctioning, using sterile precautions. The lungs must be inflated by manual inflation at regular intervals, to minimize the risk of atelectasis and infection.

2:30 Brain dead donors can develop respiratory alkalosis secondary to mech..... (3:4038 [3:4570]) - D 2: Organ Donor Problems

Brain dead donors can develop respiratory alkalosis secondary to mechanical hyperventilation as a part of treatment protocol for elevated intracranial pressure, or lactic metabolic acidosis due to dehydration or tissue ischaemia. Both have deleterious effect on tissue oxygen delivery; hence, arterial pH should be adjusted to normal values. Treatment is first directed towards correcting cause, changing ventilatory parameters and finally pharmacological agents are administered to correct the calculated acid-base deficit.

2:31 Hyperglycemia in brain-dead donors may be due to stress, catecholamin..... (4:1873 [4:2146]) - D 2: Organ Donor Problems

Hyperglycemia in brain-dead donors may be due to stress, catecholamine-induced insulin resistance, steroid administration for treatment of cerebral edema, or infusion of large amounts of dextrose-containing IV fluids.

There is no evidence of pancreatic endocrine failure

2:32 After brain death, the body becomes poikilothermic, because of loss o..... (4:3050 [4:3404]) - D 2: Organ Donor Problems

After brain death, the body becomes poikilothermic, because of loss of thalamic and hypothalamic central temperature control mechanisms. Systemic vasodilatation, administration of cold IV fluids and blood products, will further aggravate the problem. Hypothermia can lead to cardiac irritability, coagulopathy and reduce oxygen delivery to tissues. I

2:33 Coagulopathy and disseminated intravascular coagulation are not uncom..... (4:3675 [4:4016]) - D 2: Organ Donor Problems

Coagulopathy and disseminated intravascular coagulation are not uncommon findings in brain-dead donors, particularly in head injury patients, due to release of thromboplastin from the injured brain.[41,42] Other reasons are dilutional coagulopathy due to large volume resuscitation, massive blood transfusion for trauma, or hypothermia.

2:34 Brain death is also proposed to induce organ dysfunction via ischemia..... (4:4383 [5:240]) - D 2: Organ Donor Problems

Brain death is also proposed to induce organ dysfunction via ischemia reperfusion injury, due to vasoconstriction and low flow associated with autonomic storm, followed by vasodilatation and reflow. Recent studies suggest that there is up-regulation of 32

IJCCM October-December 2003 Vol 7 Issue 4 Indian J Crit Care Med January-March 2006 Vol 10 Issue 1 inflammatory cytokines, increased expression of cell adhesion molecule/antigen and widespread microvascular and endothelial changes.[43,44

2:35 Maintaining adequate systemic perfusion pressure and brisk urine outp..... (4:116 [4:579]) - D 2: Organ Donor Problems

Maintaining adequate systemic perfusion pressure and brisk urine output (>1-2 ml/kg/hr), while minimizing the use of vasopressors, contributes to good renal allograft function.[12] If urine output is less (<1 ml/kg/hr) after adequate volume loading, loop diuretics (furosemide), or osmotic diuretics (mannitol) should be used. Use of nephrotoxic drugs (aminoglycosides) and agents that adversely affect renal perfusion (e.g. NSAIDs), should be avoided.[12]

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between trans-plant organizations and countries. Cooperation between countries is increasingly important

10:1 Brain Death Brain Death occurs when: 1. The patient is in a state wh..... (1:851 [1:2219]) - D 10: Organ Donation Process

Brain Death Brain Death occurs when: 1. The patient is in a state where they will never wake up.

2. The patient loses all vital functions of the brain, which includes the ability to ever breathe on their own.

Brain death means that a person is dead even though their heart continues to beat and breathing is made possible by use of a breathing tube and a breathing machine. A series of tests are done by two doctors who are experts in the field of brain injury to confirm that the patient is brain dead.

There are times when this series of brain death tests cannot be performed, and a more highly specialized test is needed called a CT Angiogram. A CT Angiogram test looks to see if blood is flowing in the brain. If blood is not flowing in the brain, the person is brain dead.

Brain death may be difficult for family members to understand because their loved one is being supported by machines, and looks as if he/she is asleep. Brain death is not the same as a coma where some brain function is still present.

In the case of brain death, blood is still flowing to other body organs such as the heart, lungs, liver, kidneys, small bowel and pancreas. Once the patient's family makes the final decision to donate, these organs may be transplanted into another person as long as the organs are working properly; and there are no serious health concerns.

10:3 Family Consent Once brain death has happened, the Donor Coordinator w..... (2:791 [2:1433]) - D 10: Organ Donation Process

Family Consent Once brain death has happened, the Donor Coordinator will meet with the family to provide information on organ donation in a sensitive and supportive manner. During the meeting with the family, the patient remains on a breathing machine and can be given medications while the family is making a decision. The decision can be easier and less stressful for the family if they have already talked about organ donation before.

The family may give consent for which organs they wish to donate during this meeting.

Once a decision has been made by the family, then they can go forward and make all of the funeral arrangements.

10:4 Suitability A series of tests and exams are then performed to assess..... (2:1434 [2:2132]) - D 10: Organ Donation Process

Suitability A series of tests and exams are then performed to assess the organs being offered for transplant. These tests and exams determine how stable the donor is, if the organs are working properly, and if there is any risk of diseases being transmitted from the donor to the person receiving the organ. Even if the organs were healthy and strong in life, the process of brain death can cause injury to the organs, which can make them unfit for transplant.

To ensure the health and safety of the person receiving the organ (recipient), a review of the donor's medical and social history is carried out with the family using a detailed questionnaire. The questions asked are similar to the

10:5 Organ Placement Donated organs are matched to recipients based on: bl..... (2:2244 [2:2775]) - D 10: Organ Donation Process

Organ Placement Donated organs are matched to recipients based on: blood type, height, weight, and how sick the recipient is, and how long they have been waiting for a transplant. The most suitable recipient for each organ is identified before that organ is removed, because organs cannot be stored for long periods of time outside the body. Finally, for the best match of an organ to a recipient, a special blood test called HLA typing (DNA/ genetic test) is done to see which recipient would have the least chance of rejection

10:6 Organ Recovery The donor is taken to the operating room once all of t..... (2:2898 [2:3197]) - D 10: Organ Donation Process

Organ Recovery The donor is taken to the operating room once all of the tests are completed, recipients have been chosen, and the transplant teams are assembled. The donor surgery takes place in the same manner as any other surgery. The donor's organs are removed and transplanted without delay.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6

expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

○ Intensivist

3 Quotations:

2:10 the intensivist can play a very crucial role by converting a potential donor..... (1:3209 [1:3308]) - D 2: Organ Donor Problems

the intensivist can play a very crucial role by converting a potential donor into an actual donor.

10:7 After Organs Have Been Recovered The donor is kept at the hospital until..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● **Type**

5 Quotations:

10:2 In the past, death was thought to occur when the person stopped breath..... (1:2227 [1:2748]) - D 10: Organ Donation Process

In the past, death was thought to occur when the person stopped breathing and their heart also stopped. Advances in medical science now allow us to artificially support the breathing and blood pressure of a patient. This means that we now have two ways to define death: 1. Cardiovascular death- which occurs when the heart stops beating and there is no breathing.

2. Brain death - which occurs when the brain stops working, but the heart is still beating and the person breathes with the use of a breathing machine.

12:10 Brain dead donors The vast majority (80%-90%) of organs from DD are..... (2:3741 [2:4314]) - D 12: Deceased organ donation for transplantation

Brain dead donors The vast majority (80%-90%) of organs from DD are procured after declaration of death by neurologic criteria (or "brain death", BD). Brain death is determined after irreversible cessation of brain stem activity documented by bedside neurologic tests (reflexes, Table 1).

The oxygenation of a comatose person who suffered a devastating irreversible brain injury fulfilling the criteria for brain death is maintained by mechanical ventilation, while cardio-circulatory activity and organ perfusion is supported, if needed, by inotropic medications.

12:11 Donation after cardiac death Unlike BD donors, a proportion of DD, cu..... (3:1 [3:672]) - D 12: Deceased organ donation for transplantation

Donation after cardiac death Unlike BD donors, a proportion of DD, currently 16% of the organs procured nationally, are recovered after declaration of death by circulatory criteria [donation after cardiac death (DCD)][9]. In this scenario, patients who have suffered severe brain injury but do not fulfill the criteria for

brain death, may still be organ donors if the patient, by advance directive, or the patient's family decides to withdraw life support. In these circumstances, after consent for organ donation has been obtained, the patient is brought to the operating room where ventilation is disconnected and life-sustaining medications are withdrawn.

13:1 There are two types of organ donation in BC—deceased donation and living donation. (1:121 [1:1128]) - D 13: Deceased Donation

There are two types of organ donation in BC—deceased donation and living donation.

In order to be a deceased organ donor in BC, a person needs to be in an intensive care unit (ICU) and on a ventilator (breathing machine). Donation is only considered after all life-saving methods to save a patient's life have been tried.

There are two types of donation after death: Neurological determination of death (also referred to as "brain death") means the brain has permanently lost all function and a diagnosis of death using neurological criteria has been determined.

For more information on NDD, please see 'Organ Donation after Brain Death'.

Donation after Circulatory Death (DCD) is an option for organ donation for patients with severe brain injuries once a decision has been made to remove all life-sustaining treatments. When a person's heart permanently stops beating, they have experienced Circulatory Death.

For more information on DCD, please see 'Organ Donation after Circulatory Death'.

29:3 While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches. (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

12 Deceased organ donation for transplantation

8 Codes:

● Insights

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the decision. (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequelae of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass media..... (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable..... (1:1761 [1:1943]) - D 12: Deceased organ donation for transplantation

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across

Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ tra..... (8:681 [8:929]) - D 12: Deceased organ donation for transplantation

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the countr..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just

one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artificial intelligence..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● **Limitations**

3 Quotations:

2:6 lack of well-developed cadaver programme. (1:1688 [1:1729]) - D 2: Organ Donor Problems

lack of well-developed cadaver programme.

12:7 The shortage of organs has been recognized world- wide as a major limiting factor..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● **Opportunity**

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has b..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplant cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

4:10 Yet, there are many states in India that aren't still equipped to deal..... (2:2007 [2:2175]) - D 4: Green Corridor

Yet, there are many states in India that aren't still equipped to deal with "Green Corridors". But that could hopefully change as more and more awareness is created.

8:5 severe organ shortage represents a universal challenge in organ trans..... (2:2523 [2:2681]) - D 8: Strategies to optimize deceased organ donation

severe organ shortage represents a universal challenge in organ transplantation, which should be faced under the scope of a planned and integrated approach.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant

procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:10 3.1. Transplant coordination network (5:2100 [5:2135]) - D 8: Strategies to optimize deceased organ donation

3.1. Transplant coordination network

8:11 3.2. Special profile of the 3 levels of transplant coordination (6:1529 [6:1591]) - D 8: Strategies to optimize deceased organ donation

3.2. Special profile of the 3 levels of transplant coordination

8:12 3.3. Continuous audit on brain deaths and outcome of donation at ICUs (6:3643 [6:3712]) - D 8: Strategies to optimize deceased organ donation

3.3. Continuous audit on brain deaths and outcome of donation at ICUs

8:14 Organization is in fact the whole philosophy of what it has been inte..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to efectively combat organ trafcking there is need to increas..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to effectively combat organ trafficking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

● **Problems/Issues**

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

non-availability of a suitable donor

2:11 the aim of this review to provide insight into problems of brain dead..... (1:3317 [1:3446]) - D 2: Organ Donor Problems

the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

3:2 Lack of effective communication An educated donor who is willing to d..... (2:2606 [2:3202]) - D 3: Deceased organ donation

Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

3:3 Lack of organizational support The lack of an adequate number of tran..... (2:3203 [2:4064]) - D 3: Deceased organ donation

Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated and well-versed with the procedures required to conduct an organ donation program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

4:1 India's traf problem over the years has been the root cause of many d..... (1:1903 [1:2133]) - D 4: Green Corridor

India's traf problem over the years has been the root cause of many deaths. During an medical emer- gency like organ transplantaton over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

4:3 there is a massive lack of awareness about Green Corridor as well as r..... (1:3729 [1:3920]) - D 4: Green Corridor

there is a massive lack of awareness about Green Corridor as well as reluctance for organ dona- ton. Therefore, awareness should be created on a large scale so that no person is lef oblivious

4:4 India's traf problem has ofen been the cause for many deaths, nearly..... (1:904 [1:1179]) - D 4: Green Corridor

India's traf problem has ofen been the cause for many deaths, nearly 1,50,785 persons were killed in 2016 as against 1,46,133 in 2015 only because ambu- lances couldn't get patents to hospital in tme or worse, ambulances weren't able to reach the accident spots on tme.

4:5 The same applies to organ transplants - hearts and other organs from..... (1:1183 [1:1490]) - D 4: Green Corridor

The same applies to organ transplants - hearts and other organs from brain dead patients sometimes have to be transported over long distances and often from other cities. Getting them to patient who needs them in time is vital for survival. India's overcrowded roads are unsuitable for medical emergencies.

8:1 Although the number of patients in the waiting list increases over time..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, national authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait- list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for tr..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant p..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

○ **Representation**

7 Quotations:

8:6 Fig. 1. Steps in the process of donation after brain death. (2:3490 [2:3550]) - D 8: Strategies to optimize deceased organ donation

Fig. 1. Steps in the process of donation after brain death.

8:13 Table 2 Economic framework and resources dedicated to health care in..... (8:4157 [8:4257]) - D 8: Strategies to optimize deceased organ donation

Table 2 Economic framework and resources dedicated to health care in European countries (year 2004)

12:8 Figure 1 The gap between organs needed and organs available continues..... (2:4654 [2:4799]) - D 12: Deceased organ donation for transplantation

Figure 1 The gap between organs needed and organs available continues to grow. Available from: URL: [http://www.organdonor.gov/about/data.](http://www.organdonor.gov/about/data.html)

html.

12:13 BD: Brain death; OPTN: Organ Procurement Transplantation Network. (4:5822 [4:5888]) - D 12: Deceased organ donation for transplantation

BD: Brain death; OPTN: Organ Procurement Transplantation Network.

12:15 Figure 2 The number of actual organ donors is only a small proportion..... (5:3923 [5:4093]) - D 12: Deceased organ donation for transplantation

Figure 2 The number of actual organ donors is only a small proportion of the pool of deaths. A: Total deaths; B: Imminent deaths; C: Eligible deaths; D: Actual donors.

12:16 Figure 3 The process of deceased organ donation. (5:4191 [5:4240]) - D 12: Deceased organ donation for transplantation

Figure 3 The process of deceased organ donation.

24:9 Figure 10. Sequence Diagram for Organ donation system. (15:1825 [15:1878]) - D 24: Blockchain based Organ Transplant Services

Figure 10. Sequence Diagram for Organ donation system.

● **Solution**

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that fa..... (3:2615 [3:3043]) - D 3: Deceased organ donation

Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.

4:6 GREEN COR- RIDOR is an alternative to emergency lanes being im-pleme..... (2:127 [2:301]) - D 4: Green Corridor

GREEN COR- RIDOR is an alternative to emergency lanes being im- plemented to certain extent in India proclaiming the safety of its citizen and provides beter health services

12:4 Multiple steps in the process of deceased organ donation can be targe..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of d..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automa..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a

kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

○ Statistics

5 Quotations:

2:1 Cadaver donors form the largest pool of organs, approaching 95% and 7..... (1:1225 [1:1334]) - D 2: Organ Donor Problems

Cadaver donors form the largest pool of organs, approaching 95% and 70% in Europe and USA, respectively.[1]

2:7 It is estimated that every year, 3500 kidney transplants are being pe..... (1:2366 [1:2505]) - D 2: Organ Donor Problems

It is estimated that every year, 3500 kidney transplants are being performed in our country, out of which $\leq 2\%$ are from cadaver donors[4]

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplantation from Apollo hospital, Teynampet, Chennai (south) to Frontier life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

9:3 Table 3 Sources of the data for the study (6:1 [6:41]) - D 9: Organ donation/transplant rates

Table 3 Sources of the data for the study

12:18 The potential for donation varies across geographic areas of the Unit..... (4:3761 [4:4833]) - D 12: Deceased organ donation for transplantation

The potential for donation varies across geographic areas of the United States with a four-fold difference in eligible death/million population reported to OPTN by OPOs (national mean 31 eligible death/million population, ranging from 15 to 61) based on the existing geographical variability in mortality (91-229 deaths/ million population from cerebro-vascular accident and trauma)[2]. Importantly, this study highlighted that the number of eligible deaths is correlated to the number of deaths from cerebro-vascular accidents and trauma in that specific area ($r^2 = 0.79$).

Outside the United States, studies from Europe, Canada and other countries have documented similar findings regarding potential donors. In Belgium, Roels et

al[22] found that 57% of deceased potential donors were missed along the process due to non-identification or missed referral or lack of consent. Likewise, a study from Canada based on discharge data submitted to the Hospital Morbidity Database reported that only 1 in 6 potential donors (17%) became actual donor[23].

● Type

5 Quotations:

10:2 In the past, death was thought to occur when the person stopped breath..... (1:2227 [1:2748]) - D 10: Organ Donation Process

In the past, death was thought to occur when the person stopped breathing and their heart also stopped. Advances in medical science now allow us to artificially support the breathing and blood pressure of a patient. This means that we now have two ways to define death: 1. Cardiovascular death- which occurs when the heart stops beating and there is no breathing.

2. Brain death - which occurs when the brain stops working, but the heart is still beating and the person breathes with the use of a breathing machine.

12:10 Brain dead donors The vast majority (80%-90%) of organs from DD are..... (2:3741 [2:4314]) - D 12: Deceased organ donation for transplantation

Brain dead donors The vast majority (80%-90%) of organs from DD are procured after declaration of death by neurologic criteria (or “brain death”, BD). Brain death is determined after irreversible cessation of brain stem activity documented by bedside neurologic tests (reflexes, Table 1).

The oxygenation of a comatose person who suffered a devastating irreversible brain injury fulfilling the criteria for brain death is maintained by mechanical ventilation, while cardio-circulatory activity and organ perfusion is supported, if needed, by inotropic medications.

12:11 Donation after cardiac death Unlike BD donors, a proportion of DD, cu..... (3:1 [3:672]) - D 12: Deceased organ donation for transplantation

Donation after cardiac death Unlike BD donors, a proportion of DD, currently 16% of the organs procured nationally, are recovered after declaration of death by circulatory criteria [donation after cardiac death (DCD)][9]. In this scenario, patients who have suffered severe brain injury but do not fulfill the criteria for brain death, may still be organ donors if the patient, by advance directive, or the patient’s family decides to withdraw life support. In these circumstances, after consent for organ donation has been obtained, the patient is brought to the operating room where ventilation is disconnected and life-sustaining medications are withdrawn.

13:1 There are two types of organ donation in BC—deceased donation and liv..... (1:121 [1:1128]) - D 13: Deceased Donation

There are two types of organ donation in BC—deceased donation and living donation.

In order to be a deceased organ donor in BC, a person needs to be in an intensive care unit (ICU) and on a ventilator (breathing machine). Donation is only considered after all life-saving methods to save a patient's life have been tried.

There are two types of donation after death: Neurological determination of death (also referred to as "brain death") means the brain has permanently lost all function and a diagnosis of death using neurological criteria has been determined.

For more information on NDD, please see 'Organ Donation after Brain Death' .

Donation after Circulatory Death (DCD) is an option for organ donation for patients with severe brain injuries once a decision has been made to remove all life-sustaining treatments. When a person's heart permanently stops beating, they have experienced Circulatory Death.

For more information on DCD, please see 'Organ Donation after Circulatory Death'

29:3 While these tools can be used to help improve clinical decisions in d..... (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

13 Deceased Donation

1 Codes:

● **Type**

5 Quotations:

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While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

14 Matching Donors and Recipients

6 Codes:

● Conditions

21 Quotations:

2:13 Any comatose patient with a known aetiology of irreversible cerebral..... (2:139 [2:980]) - D 2: Organ Donor Problems

Any comatose patient with a known aetiology of irreversible cerebral damage who is likely to progress to brain death prior to terminal circulatory arrest, should be considered a potential organ donor. The absolute contraindications are: • Uncontrolled sepsis • Active viral infection - Hepatitis B and C, CMV, Herpes simplex • HIV-positive serology • Malignancy (except primary intracranial tumor, non melanotic skin cancer and Ca-cervix in situ) Ideally, the donor should be less than 60 years of age, without end organ damage from systemic disease, but these criteria have been liberalized, considering organ shortage.[6] Besides these general criteria, it is important to determine the intrinsic function of the organs to be transplanted and to ascertain that the illness has not impaired these organs irreversibly.

2:14 Brain death is a catastrophic physiological event, associated with si..... (2:1013 [2:1482]) - D 2: Organ Donor Problems

Brain death is a catastrophic physiological event, associated with significant deterioration in the function of the organs distant from the brain. These changes occur due to the process of brain dying, as well as due to loss of integrated neurological function, with its central role in the coordination of autonomic and other basic organ functions. Even with maximal support, cardio-respiratory deterioration leading to somatic death will occur within days.[7,8]

2:15 The most important goals in the management of brain dead organ donors..... (2:2343 [2:2695]) - D 2: Organ Donor Problems

The most important goals in the management of brain dead organ donors are: hemodynamic stability and support of body homeostasis until the organs are retrieved. There is a shift in emphasis from cerebral protection with its usual accompaniment of intravascular volume depletion, to the optimization of organ perfusion and tissue oxygen delivery.

2:16 Regular nursing care must be continued after brain death. Frequent tu..... (2:2725 [2:3615]) - D 2: Organ Donor Problems

Regular nursing care must be continued after brain death. Frequent turning of patient for decubitus ulcer prophylaxis, skin care, dressing changes, urinary and intravascular catheter care, must be meticulous to minimize the risk of infection. A nasogastric tube must be inserted for gastric decompression and prevention of aspiration. If necessary, arterial and central venous lines should be inserted into the upper extremities, because femoral line readings can become inaccurate during surgical procedure for organ procurement.[11] Routine monitoring includes ECG, blood pressure, pulse oximetry, core temperature, U/O and central venous pressure. Use of a Swan-Ganz catheter for measurement of pulmonary capillary wedge pressure and pulmonary venous oxymetry, should be reserved for unstable donors, who have persistent acidosis with evidence of tissue hypoperfusion.[12]

2:21 Hypotension is the most common hemodynamic abnormality observed in up..... (2:4204 [2:4460]) - D 2: Organ Donor Problems

Hypotension is the most common hemodynamic abnormality observed in upto 91% of brain-dead organ donors.[14] The contributing factors are multifactorial and include hypovolaemia, damage to vasomotor centre, left heart dysfunction and endocrine failure.

2:29 After brain death is declared, vigorous tracheobronchial toilet is im..... (3:2977 [3:3230]) - D 2: Organ Donor Problems

After brain death is declared, vigorous tracheobronchial toilet is important with frequent suctioning, using sterile precautions. The lungs must be inflated by manual inflation at regular intervals, to minimize the risk of atelectasis and infection.

2:30 Brain dead donors can develop respiratory alkalosis secondary to mech..... (3:4038 [3:4570]) - D 2: Organ Donor Problems

Brain dead donors can develop respiratory alkalosis secondary to mechanical hyperventilation as a part of treatment protocol for elevated intracranial pressure, or lactic metabolic acidosis due to dehydration or tissue ischaemia. Both have deleterious effect on tissue oxygen delivery; hence, arterial pH should be adjusted to normal values. Treatment is first directed towards correcting cause, changing ventilatory parameters and finally pharmacological agents are administered to correct the calculated acid-base deficit.

2:31 Hyperglycemia in brain-dead donors may be due to stress, catecholamin..... (4:1873 [4:2146]) - D 2: Organ Donor Problems

Hyperglycemia in brain-dead donors may be due to stress, catecholamine-induced insulin resistance, steroid administration for treatment of cerebral edema, or infusion of large amounts of dextrose-containing IV fluids.

There is no evidence of pancreatic endocrine failure

2:32 After brain death, the body becomes poikilothermic, because of loss o..... (4:3050 [4:3404]) - D 2: Organ Donor Problems

After brain death, the body becomes poikilothermic, because of loss of thalamic and hypothalamic central temperature control mechanisms. Systemic vasodilatation, administration of cold IV fluids and blood products, will further aggravate the problem. Hypothermia can lead to cardiac irritability, coagulopathy and reduce oxygen delivery to tissues. I

2:33 Coagulopathy and disseminated intravascular coagulation are not uncom..... (4:3675 [4:4016]) - D 2: Organ Donor Problems

Coagulopathy and disseminated intravascular coagulation are not uncommon findings in brain-dead donors, particularly in head injury patients, due to release of thromboplastin from the injured brain.[41,42] Other reasons are dilutional coagulopathy due to large volume resuscitation, massive blood transfusion for trauma, or hypothermia.

2:34 Brain death is also proposed to induce organ dysfunction via ischemia..... (4:4383 [5:240]) - D 2: Organ Donor Problems

Brain death is also proposed to induce organ dysfunction via ischemia reperfusion injury, due to vasoconstriction and low flow associated with autonomic storm, followed by vasodilatation and reflow. Recent studies suggest that there is up-regulation of 32

IJCCM October-December 2003 Vol 7 Issue 4 Indian J Crit Care Med January-March 2006 Vol 10 Issue 1 inflammatory cytokines, increased expression of cell adhesion molecule/antigen and widespread microvascular and endothelial changes.[43,44

2:35 Maintaining adequate systemic perfusion pressure and brisk urine outp..... (4:116 [4:579]) - D 2: Organ Donor Problems

Maintaining adequate systemic perfusion pressure and brisk urine output (>1-2 ml/kg/hr), while minimizing the use of vasopressors, contributes to good renal allograft function.[12] If urine output is less (<1 ml/kg/hr) after adequate volume loading, loop diuretics (furosemide), or osmotic diuretics (mannitol) should be used. Use of nephrotoxic drugs (aminoglycosides) and agents that adversely affect renal perfusion (e.g. NSAIDs), should be avoided.[12]

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

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10:1 Brain Death Brain Death occurs when: 1. The patient is in a state wh..... (1:851 [1:2219]) - D 10: Organ Donation Process

Brain Death Brain Death occurs when: 1. The patient is in a state where they will never wake up.

2. The patient loses all vital functions of the brain, which includes the ability to ever breathe on their own.

Brain death means that a person is dead even though their heart continues to beat and breathing is made possible by use of a breathing tube and a breathing machine. A series of tests are done by two doctors who are experts in the field of brain injury to confirm that the patient is brain dead.

There are times when this series of brain death tests cannot be performed, and a more highly specialized test is needed called a CT Angiogram. A CT Angiogram test looks to see if blood is flowing in the brain. If blood is not flowing in the brain, the person is brain dead.

Brain death may be difficult for family members to understand because their loved one is being supported by machines, and looks as if he/she is asleep. Brain death is not the same as a coma where some brain function is still present.

In the case of brain death, blood is still flowing to other body organs such as the heart, lungs, liver, kidneys, small bowel and pancreas. Once the patient's family makes the final decision to donate, these organs may be transplanted into another person as long as the organs are working properly; and there are no serious health concerns.

10:3 Family Consent Once brain death has happened, the Donor Coordinator w..... (2:791 [2:1433]) - D 10: Organ Donation Process

Family Consent Once brain death has happened, the Donor Coordinator will meet with the family to provide information on organ donation in a sensitive and supportive manner. During the meeting with the family, the patient remains on a breathing machine and can be given medications while the family is making a decision. The decision can be easier and less stressful for the family if they have already talked about organ donation before.

The family may give consent for which organs they wish to donate during this meeting.

Once a decision has been made by the family, then they can go forward and make all of the funeral arrangements.

10:4 Suitability A series of tests and exams are then performed to assess..... (2:1434 [2:2132]) - D 10: Organ Donation Process

Suitability A series of tests and exams are then performed to assess the organs being offered for transplant. These tests and exams determine how stable the donor is, if the organs are working properly, and if there is any risk of diseases being transmitted from the donor to the person receiving the organ. Even if the organs were healthy and strong in life, the process of brain death can cause injury to the organs, which can make them unfit for transplant.

To ensure the health and safety of the person receiving the organ (recipient), a review of the donor's medical and social history is carried out with the family using a detailed questionnaire. The questions asked are similar to the

10:5 Organ Placement Donated organs are matched to recipients based on: bl..... (2:2244 [2:2775]) - D 10: Organ Donation Process

Organ Placement Donated organs are matched to recipients based on: blood type, height, weight, and how sick the recipient is, and how long they have been waiting for a transplant. The most suitable recipient for each organ is identified before that organ is removed, because organs cannot be stored for long periods of time outside the body. Finally, for the best match of an organ to a recipient, a special blood test called HLA typing (DNA/ genetic test) is done to see which recipient would have the least chance of rejection

10:6 Organ Recovery The donor is taken to the operating room once all of t..... (2:2898 [2:3197]) - D 10: Organ Donation Process

Organ Recovery The donor is taken to the operating room once all of the tests are completed, recipients have been chosen, and the transplant teams are assembled. The donor surgery takes place in the same manner as any other surgery. The donor's organs are removed and transplanted without delay.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

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When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6

expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Criterion

3 Quotations:

3:1 There are stringent criteria instituted for the retrieval, preservatio..... (1:1505 [1:1710]) - D 3: Deceased organ donation

There are stringent criteria instituted for the retrieval, preservation and transportation of donor organs. This article reviews the ongoing efforts being implemented to encourage organ transplantation.

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
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● Factors

15 Quotations:

2:12 Recognition of Potential Organ Donor (2:101 [2:136]) - D 2: Organ Donor Problems

Recognition of Potential Organ Donor

2:17 Pathophysiology of Brain Death (2:981 [2:1010]) - D 2: Organ Donor Problems

Pathophysiology of Brain Death

2:18 Intensive Care Management (2:2316 [2:2340]) - D 2: Organ Donor Problems

Intensive Care Management

2:19 Routine Care and Monitoring (2:2696 [2:2722]) - D 2: Organ Donor Problems

Routine Care and Monitoring

2:20 Cardiovascular Support (2:4180 [2:4201]) - D 2: Organ Donor Problems

Cardiovascular Support

2:22 Ventilatory Support (3:2956 [3:2974]) - D 2: Organ Donor Problems

Ventilatory Support

2:23 Renal Support (4:101 [4:113]) - D 2: Organ Donor Problems

Renal Support

2:24 Temperature Regulation (4:3026 [4:3047]) - D 2: Organ Donor Problems

Temperature Regulation

2:25 Coagulation System (4:3655 [4:3672]) - D 2: Organ Donor Problems

Coagulation System

2:26 Endocrine Dysfunction (4:582 [4:602]) - D 2: Organ Donor Problems

Endocrine Dysfunction

2:27 Ischaemia-Reperfusion Injury (4:4353 [4:4380]) - D 2: Organ Donor Problems

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17:2 1. Positive attitude of public towards organ donation 2. Consent by r..... (1:541 [1:880]) - D 17: Cadaver Organ Donation

1. Positive attitude of public towards organ donation 2. Consent by relatives for organ donation in event of brain death.
3. Successful brain Death identification and certification.
4. Adequate hospital infra-structural and support logistics 5. Successful retrieval and transplantation of organs and auditing long term graft outcomes.

20:2 A range of factors influence those allocation decisions—or allocation..... (2:1187 [2:1578]) - D 20: Maximising patient outcomes (IBM)

A range of factors influence those allocation decisions—or allocation schemes, as they're called—every- thing from the age, size, and clinical condition of the donor and recipient to the unique physiology of each organ type. Medical determinants shaping the development of a suc- cessful kidney allocation scheme, for example, are entirely distinct from those of a heart or liver.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that

particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

○ Match

1 Quotations:

14:2 The Matching Process by Organ (2:421 [2:449]) - D 14: Matching Donors and Recipients

The Matching Process by Organ

○ Organ

7 Quotations:

14:3 Hearts (2:460 [2:466]) - D 14: Matching Donors and Recipients

Hearts

14:4 Lungs (2:1113 [2:1117]) - D 14: Matching Donors and Recipients

Lungs

14:5 Livers (3:869 [3:875]) - D 14: Matching Donors and Recipients

Livers

14:6 Kidneys (3:1836 [3:1842]) - D 14: Matching Donors and Recipients

Kidneys

14:7 Pancreata (4:834 [4:842]) - D 14: Matching Donors and Recipients

Pancreata

14:8 Intestines (4:1396 [4:1405]) - D 14: Matching Donors and Recipients

Intestines

17:3 Kidney 379 Heart 34 Liver 12 Pancreas 02 Lungs 01 TOTAL 428 (1:2686 [1:2749]) - D 17: Cadaver Organ Donation

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● Process

12 Quotations:

2:9 Successful Organ Donation Requires • Identification of potential orga..... (1:2789 [1:3051]) - D 2: Organ Donor Problems

Successful Organ Donation Requires • Identification of potential organ donor • Determination and certification of brain death • Consent to organ donation from the family • Diagnosis and management of organ donor problems • Organ retrieval and transplantation

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6 expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

15:1 Registering as a Donor The process of donation most often begins with..... (1:616 [1:973]) - D 15: The Deceased Donation Process

Registering as a Donor The process of donation most often begins with your consent to be a donor by registering in your state. Signing up does not guarantee you will be able to donate your organs, eyes, or tissues—and registering usually takes place many years before donation becomes possible. But it is the first step to being eligible to save lives.

15:2 Medical Care of Potential Donors For someone to become a deceased don..... (1:1019 [2:354]) - D 15: The Deceased Donation Process

Medical Care of Potential Donors For someone to become a deceased donor, he or she has to die in very specific circumstances. Most often, a patient comes to a hospital because of illness or accident, such as a severe head trauma, a brain aneurysm (/about/facts- ☐ ☐

12/19/2019 The Deceased Donation Process | Organ Donor

<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse> 2/6 terms/terms.html#a) or stroke.

The patient is put on artificial or mechanical support, which keeps blood with oxygen flowing to the organs. The medical team does everything possible to save the patient's life. At

15:3 Brain Death Testing Even though the medical team members do everything..... (2:436 [2:915]) - D 15: The Deceased Donation Process

Brain Death Testing Even though the medical team members do everything they can to save the patient's life, sometimes the injuries are too severe and the patient dies.

If the patient is dead and is not responding, physicians will perform a series of tests to determine if brain death has occurred. A patient who is brain dead has no

brain activity and cannot breathe on his or her own. Brain death is death and it is irreversible. Someone who is brain dead cannot recover.

15:4 The Organ Procurement Organization The hospital notifies the local Org..... (2:1063 [2:1554]) - D 15: The Deceased Donation Process

The Organ Procurement Organization The hospital notifies the local Organ Procurement Organization (OPO) (/about/facts-terms/terms.html#div_3&#o) of every patient that has died or is nearing death. This is in keeping with federal regulations.

The hospital gives the OPO information about the deceased patient to confirm whether he or she has the potential to be a donor. If the person could be a candidate for donation, a representative from the OPO travels immediately to the hospital.

15:5 Authorizing Donation The OPO representative searches to see if the de..... (2:1618 [2:1986]) - D 15: The Deceased Donation Process

Authorizing Donation The OPO representative searches to see if the deceased is registered as a donor on their state registry. If so, that will serve as legal consent for donation.

If the deceased has not registered, and there was no other legal consent for donation, such as a notation on the driver's license, the OPO will ask the next of kin for authorization.

15:6 The Matching Process If the deceased person's evaluation allows donat..... (3:286 [3:844]) - D 15: The Deceased Donation Process

The Matching Process If the deceased person's evaluation allows donation, the OPO contacts the Organ Procurement and Transplantation Network (OPTN) (/about/facts- terms/terms.html#div_3&#o).

The OPTN operates the national database of all patients in the U.S. waiting for a transplant. The OPO enters information about the deceased donor into the computer system and the search begins.

The computer system generates a list of patients who match the donor (by organ).

Each available organ is offered to the transplant team of the best-matched patient.

15:7 Recovering and Transporting Organs While the search for matching recipients..... (3:1272 [4:473]) - D 15: The Deceased Donation Process

Recovering and Transporting Organs While the search for matching recipients is under way, the deceased donor's organs are maintained on artificial support. Machines keep blood containing oxygen flowing to the organs. The condition of each organ is carefully monitored by the hospital medical staff and the OPO procurement coordinator.

A transplant surgical team replaces the medical team that treated the patient before death. (The medical team trying to save the patient's life and the transplant team are never the same team.) The surgical team removes the organs and tissues from the donor's body in an operating room. First, organs are recovered, and then additional authorized tissues such as bone, cornea, and skin. All incisions are surgically closed. Organ donation does not interfere with open-casket funerals.

□ □

12/19/2019 The Deceased Donation Process | Organ Donor
<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse> 4/6 Organs remain healthy only for a short period of time after removal from the donor, so minutes count. The OPO representative arranges the transportation of the organs to the hospitals of the intended recipients. Transportation depends on the distance involved, and can include ambulances, helicopters, and commercial airplanes.

15:8 Transplanting the Organs The transplant operation takes place after t..... (4:567 [4:958]) - D 15: The Deceased Donation Process

Transplanting the Organs The transplant operation takes place after the transport team arrives at the hospital with the new organ. The transplant recipient is typically waiting at the hospital and may already be in the operating room awaiting the arrival of the lifesaving organ.

Surgical teams work around the clock as needed to transplant the new organs into the waiting recipients.

32:1 Ahead of an organ being removed from the donor, complete consensus mus..... (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

15 The Deceased Donation Process

1 Codes:

● Process

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8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between transplant organizations and countries. Cooperation between countries is increasingly important

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6 expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

15:1 Registering as a Donor The process of donation most often begins with..... (1:616 [1:973]) - D 15: The Deceased Donation Process

Registering as a Donor The process of donation most often begins with your consent to be a donor by registering in your state. Signing up does not guarantee you will be able to donate your organs, eyes, or tissues—and registering usually takes place many years before donation becomes possible. But it is the first step to being eligible to save lives.

15:2 Medical Care of Potential Donors For someone to become a deceased don..... (1:1019 [2:354]) - D 15: The Deceased Donation Process

Medical Care of Potential Donors For someone to become a deceased donor, he or she has to die in very specific circumstances. Most often, a patient comes to a hospital because of illness or accident, such as a severe head trauma, a brain aneurysm (/about/facts- □ □

12/19/2019 The Deceased Donation Process | Organ Donor
<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse> 2/6 terms/terms.html#a) or stroke.

The patient is put on artificial or mechanical support, which keeps blood with oxygen flowing to the organs. The medical team does everything possible to save the patient's life. At

15:3 Brain Death Testing Even though the medical team members do everything..... (2:436 [2:915]) - D 15: The Deceased Donation Process

Brain Death Testing Even though the medical team members do everything they can to save the patient's life, sometimes the injuries are too severe and the patient dies.

If the patient is dead and is not responding, physicians will perform a series of tests to determine if brain death has occurred. A patient who is brain dead has no brain activity and cannot breathe on his or her own. Brain death is death and it is irreversible. Someone who is brain dead cannot recover.

15:4 The Organ Procurement Organization The hospital notifies the local Org..... (2:1063 [2:1554]) - D 15: The Deceased Donation Process

The Organ Procurement Organization The hospital notifies the local Organ Procurement Organization (OPO) (/about/facts-terms/terms.html#div_3&#o) of every patient that has died or is nearing death. This is in keeping with federal regulations.

The hospital gives the OPO information about the deceased patient to confirm whether he or she has the potential to be a donor. If the person could be a candidate for donation, a representative from the OPO travels immediately to the hospital.

15:5 Authorizing Donation The OPO representative searches to see if the de..... (2:1618 [2:1986]) - D 15: The Deceased Donation Process

Authorizing Donation The OPO representative searches to see if the deceased is registered as a donor on their state registry. If so, that will serve as legal consent for donation.

If the deceased has not registered, and there was no other legal consent for donation, such as a notation on the driver's license, the OPO will ask the next of kin for authorization.

15:6 The Matching Process If the deceased person's evaluation allows donation..... (3:286 [3:844]) - D 15: The Deceased Donation Process

The Matching Process If the deceased person's evaluation allows donation, the OPO contacts the Organ Procurement and Transplantation Network (OPTN) ([/about/facts-terms/terms.html#div_3&#o](#)).

The OPTN operates the national database of all patients in the U.S. waiting for a transplant. The OPO enters information about the deceased donor into the computer system and the search begins.

The computer system generates a list of patients who match the donor (by organ).

Each available organ is offered to the transplant team of the best-matched patient.

15:7 Recovering and Transporting Organs While the search for matching recipient..... (3:1272 [4:473]) - D 15: The Deceased Donation Process

Recovering and Transporting Organs While the search for matching recipients is under way, the deceased donor's organs are maintained on artificial support. Machines keep blood containing oxygen flowing to the organs. The condition of each organ is carefully monitored by the hospital medical staff and the OPO procurement coordinator.

A transplant surgical team replaces the medical team that treated the patient before death. (The medical team trying to save the patient's life and the transplant team are never the same team.) The surgical team removes the organs and tissues from the donor's body in an operating room. First, organs are recovered, and then additional authorized tissues such as bone, cornea, and skin. All incisions are surgically closed. Organ donation does not interfere with open-casket funerals.

□ □

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[https://www.organdonor.gov/about/process/deceased-](https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse)

[donation.html#expandcollapse](https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse) 4/6 Organs remain healthy only for a short period of time after removal from the donor, so minutes count. The OPO representative arranges the transportation of the organs to the hospitals of the intended recipients. Transportation depends on the distance involved, and can include ambulances, helicopters, and commercial airplanes.

15:8 Transplanting the Organs The transplant operation takes place after transplant..... (4:567 [4:958]) - D 15: The Deceased Donation Process

Transplanting the Organs The transplant operation takes place after the transport team arrives at the hospital with the new organ. The transplant recipient is

typically waiting at the hospital and may already be in the operating room awaiting the arrival of the lifesaving organ.

Surgical teams work around the clock as needed to transplant the new organs into the waiting recipients.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to 100,000 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

17 Cadaver Organ Donation

5 Codes:

○ **Benchmark**

2 Quotations:

8:8 The Spanish Model of Organ Donation: an integrated approach to face o..... (3:2596 [3:2678]) - D 8: Strategies to optimize deceased organ donation

The Spanish Model of Organ Donation: an integrated approach to face organ shortage

17:4 As the cadaver program is still in infancy stage the early results of..... (2:4913 [2:5263]) - D 17: Cadaver Organ Donation

As the cadaver program is still in infancy stage the early results of kidney cadaver transplants are acceptable. Two hospitals (All India Institute of Medical Science, Delhi and Madras Medical Mission, Chennai) are undertaking heart transplants. Only one hospital, Indraprastha Apollo Hospital Delhi is undertaking liver transplants regularly.

● **Factors**

15 Quotations:

2:12 Recognition of Potential Organ Donor (2:101 [2:136]) - D 2: Organ Donor Problems

Recognition of Potential Organ Donor

2:17 Pathophysiology of Brain Death (2:981 [2:1010]) - D 2: Organ Donor Problems

Pathophysiology of Brain Death

2:18 Intensive Care Management (2:2316 [2:2340]) - D 2: Organ Donor Problems

Intensive Care Management

2:19 Routine Care and Monitoring (2:2696 [2:2722]) - D 2: Organ Donor Problems

Routine Care and Monitoring

2:20 Cardiovascular Support (2:4180 [2:4201]) - D 2: Organ Donor Problems

Cardiovascular Support

2:22 Ventilatory Support (3:2956 [3:2974]) - D 2: Organ Donor Problems

Ventilatory Support

2:23 Renal Support (4:101 [4:113]) - D 2: Organ Donor Problems

Renal Support

2:24 Temperature Regulation (4:3026 [4:3047]) - D 2: Organ Donor Problems

Temperature Regulation

2:25 Coagulation System (4:3655 [4:3672]) - D 2: Organ Donor Problems

Coagulation System

2:26 Endocrine Dysfunction (4:582 [4:602]) - D 2: Organ Donor Problems

Endocrine Dysfunction

2:27 Ischaemia-Reperfusion Injury (4:4353 [4:4380]) - D 2: Organ Donor Problems

Ischaemia-Reperfusion Injury

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6 expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

17:2 1. Positive attitude of public towards organ donation 2. Consent by r..... (1:541 [1:880]) - D 17: Cadaver Organ Donation

1. Positive attitude of public towards organ donation 2. Consent by relatives for organ donation in event of brain death.
3. Successful brain Death identification and certification.
4. Adequate hospital infra-structural and support logistics 5. Successful retrieval and transplantation of organs and auditing long term graft outcomes.

20:2 A range of factors influence those allocation decisions—or allocation..... (2:1187 [2:1578]) - D 20: Maximising patient outcomes (IBM)

A range of factors influence those allocation decisions—or allocation schemes, as they're called—every- thing from the age, size, and clinical condition of the donor and recipient to the unique physiology of each organ type. Medical determinants shaping the development of a suc- cessful kidney allocation scheme, for example, are entirely distinct from those of a heart or liver.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

● **Insights**

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the n..... (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequele of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass me..... (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process

of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the countr..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artificial intelligence..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● Legislation

2 Quotations:

3:7 Legislation Transplantation of Human Organ Bill was introduced in the..... (4:272 [4:841]) - D 3: Deceased organ donation

Legislation Transplantation of Human Organ Bill was introduced in the Lok Sabha on 20th August 1992. Transplantation of Human Organ Act (THOA) was passed in 1994. This is the primary legislation related to organ donation and transplantation in India. Before the introduction of this Act, the regulations for organ donation and transplantation in India were nonexistent and malpractices were rampant. The amendment to the Act was passed by the parliament in 2011, and the rules were notified in 2014 as the Transplantation of Human Organs and Tissue Rules – 2014.[6]

17:1 Transplantation of Human Organ (THO) Act' in 1994, it has been possib..... (1:287 [1:538]) - D 17: Cadaver Organ Donation

Transplantation of Human Organ (THO) Act' in 1994, it has been possible to undertake multi-organ transplant activity from brain dead donors. The required pre-requisite for success of the cadaver program depend on various factors1-3 and these include:

○ **Organ**

7 Quotations:

14:3 Hearts (2:460 [2:466]) - D 14: Matching Donors and Recipients

Hearts

14:4 Lungs (2:1113 [2:1117]) - D 14: Matching Donors and Recipients

Lungs

14:5 Livers (3:869 [3:875]) - D 14: Matching Donors and Recipients

Livers

14:6 Kidneys (3:1836 [3:1842]) - D 14: Matching Donors and Recipients

Kidneys

14:7 Pancreata (4:834 [4:842]) - D 14: Matching Donors and Recipients

Pancreata

14:8 Intestines (4:1396 [4:1405]) - D 14: Matching Donors and Recipients

Intestines

17:3 Kidney 379 Heart 34 Liver 12 Pancreas 02 Lungs 01 TOTAL 428 (1:2686 [1:2749]) - D 17: Cadaver Organ Donation

Kidney 379 Heart 34 Liver 12 Pancreas 02 Lungs 01 TOTAL 428

19 Organ donation and AI

9 Codes:

● Artificial Intelligence

5 Quotations:

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:2 AI can already identify potential donors and recipients; in the future..... (2:3001 [3:328]) - D 21: A.I.'s contribution to the global economy

AI can already identify potential donors and recipients; in the future, it will be able to account for even richer patient data, perhaps including moral and religious

12/21/2019 AI and Biotechnology - these two super technologies are combining | World Economic Forum <https://www.weforum.org/agenda/2019/09/artificial-intelligence-meets-biotechnology/> 3/4 factors, to help with sequencing and triage decisions (that is, determining whether someone should get a transplant before someone else).

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:3 While these tools can be used to help improve clinical decisions in data..... (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

● Opportunity

16 Quotations:

2:8 There is a large pool of cadaver donors available in our country and..... (1:2564 [1:2719]) - D 2: Organ Donor Problems

There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

3:4 Transplant coordinators Appointment of a transplant coordinator has b..... (3:1408 [3:1793]) - D 3: Deceased organ donation

Transplant coordinators Appointment of a transplant coordinator has been made mandatory for all transplant centers. They help in counseling of families for taking consent for organ donation and coordinate the process of donation and transplantation. They should be employees of the registered hospital and possess qualifications related to medicine, social work or public health.[6]

4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplant cases known as a 'Green Corridor'

4:7 A GREEN CORRIDOR is a special route where all the street signals are..... (2:305 [2:504]) - D 4: Green Corridor

A GREEN CORRIDOR is a special route where all the street signals are manually operated and the traffic is controlled to avoid any obstacle to ensure quick medical aid to the patient at the earliest.

4:10 Yet, there are many states in India that aren't still equipped to deal..... (2:2007 [2:2175]) - D 4: Green Corridor

Yet, there are many states in India that aren't still equipped to deal with "Green Corridors". But that could hopefully change as more and more awareness is created.

8:5 severe organ shortage represents a universal challenge in organ trans..... (2:2523 [2:2681]) - D 8: Strategies to optimize deceased organ donation

severe organ shortage represents a universal challenge in organ transplantation, which should be faced under the scope of a planned and integrated approach.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:10 3.1. Transplant coordination network (5:2100 [5:2135]) - D 8: Strategies to optimize deceased organ donation

3.1. Transplant coordination network

8:11 3.2. Special profile of the 3 levels of transplant coordination (6:1529 [6:1591]) - D 8: Strategies to optimize deceased organ donation

3.2. Special profile of the 3 levels of transplant coordination

8:12 3.3. Continuous audit on brain deaths and outcome of donation at ICUs (6:3643 [6:3712]) - D 8: Strategies to optimize deceased organ donation

3.3. Continuous audit on brain deaths and outcome of donation at ICUs

8:14 Organization is in fact the whole philosophy of what it has been inte..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to effectively combat organ trafficking there is need to increase..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to effectively combat organ trafficking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

● **Optimization**

4 Quotations:

19:9 In the long term, he added, "it's not just about prediction (of outcomes)..... (2:3380 [2:3598]) - D 19: Organ donation and AI

In the long term, he added, "it's not just about prediction (of outcomes), it's also about optimization. If our studies lead to better understanding of how these things work, we'll have a brand new set of algorithms

20:1 “Making the most of our donor pool is absolutely critical to saving more lives, and improving our processes for making allocation decisions means we can use more organs than we would otherwise.” (2:986 [2:1184]) - D 20: Maximising patient outcomes (IBM)

“Making the most of our donor pool is absolutely critical to saving more lives, and improving our processes for making allocation decisions means we can use more organs than we would otherwise.”

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

29:4 Essential outcomes The solution must: develop a tool that leverages..... (2:872 [2:1728]) - D 29: Machine learning to improve organ donation rates and make better matches

Essential outcomes The solution must: develop a tool that leverages technological approaches in Deep Learning and Artificial Intelligence to: Continually improve the predictive ability of real-time, clinical decision support tools so that it may be used by donation and transplant physicians across Canada to accurately identify candidates that are mostly likely to be successful donors; Personalize kidney transplantation by predicting the success of potential donor- recipient matches and choosing those with the best chances for excellent long-term transplant outcomes; Reduce unsuccessful DCD attempts and improve transplant outcomes, thereby enhancing family experience of donation and optimizing system costs.

develop a tool that is able to match kidneys to transplantation recipients, but is also expandable to other organs, as needed.

● **Predictions**

2 Quotations:

19:8 "For patients, it will mean a big change. If they say 'no' to a donation..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

19:9 In the long term, he added, "it's not just about prediction (of outcomes)..... (2:3380 [2:3598]) - D 19: Organ donation and AI

In the long term, he added, "it's not just about prediction (of outcomes), it's also about optimization. If our studies lead to better understanding of how these things work, we'll have a brand new set of algorithms

● **Problems/Issues**

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

non-availability of a suitable donor

2:11 the aim of this review to provide insight into problems of brain dead..... (1:3317 [1:3446]) - D 2: Organ Donor Problems

the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

3:2 Lack of effective communication An educated donor who is willing to d..... (2:2606 [2:3202]) - D 3: Deceased organ donation

Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

3:3 Lack of organizational support The lack of an adequate number of tran..... (2:3203 [2:4064]) - D 3: Deceased organ donation

Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated and well-versed with the procedures required to conduct an organ donation program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

4:1 India's traf problem over the years has been the root cause of many d..... (1:1903 [1:2133]) - D 4: Green Corridor

India's traffic problem over the years has been the root cause of many deaths. During an medical emergency like organ transplantation over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

4:3 there is a massive lack of awareness about Green Corridor as well as r..... (1:3729 [1:3920]) - D 4: Green Corridor

there is a massive lack of awareness about Green Corridor as well as reluctance for organ donation. Therefore, awareness should be created on a large scale so that no person is left oblivious

4:4 India's traffic problem has often been the cause for many deaths, nearly..... (1:904 [1:1179]) - D 4: Green Corridor

India's traffic problem has often been the cause for many deaths, nearly 1,50,785 persons were killed in 2016 as against 1,46,133 in 2015 only because ambulances couldn't get patients to hospital in time or worse, ambulances weren't able to reach the accident spots on time.

4:5 The same applies to organ transplants - hearts and other organs from..... (1:1183 [1:1490]) - D 4: Green Corridor

The same applies to organ transplants - hearts and other organs from brain dead patients sometimes have to be transported over long distances and often from other cities. Getting them to patient who needs them in time is vital for survival. India's overcrowded roads are unsuitable for medical emergencies.

8:1 Although the number of patients in the waiting list increases over ti..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, na..... (1:2351 [1:2595]) - D 9: Organ donation/transplant rates

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programa Armenia, Azerbaijan, Bangla..... (5:3915 [5:4054]) - D 9: Organ donation/transplant rates

Inactive deceased or living donor programa Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the sho..... (1:1483 [1:1631]) - D 12: Deceased organ donation for transplantation

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait- list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for tr..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant p..... (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

● **Requirements**

1 Quotations:

19:5 Second, they want to learn in detail what physicians and patients are..... (1:2364 [1:2566]) - D 19: Organ donation and AI

Second, they want to learn in detail what physicians and patients are looking for in terms of the information they need to make better decisions together on whether to accept a donated kidney or not.

● **Scope**

3 Quotations:

19:1 What if a surgeon could use better mathematics to predict how long a..... (1:925 [1:1064]) - D 19: Organ donation and AI

What if a surgeon could use better mathematics to predict how long a donated organ would last before transplanting it into his patient?

19:2 What if the patient could know exactly how much better an organ from..... (1:1065 [1:1176]) - D 19: Organ donation and AI

What if the patient could know exactly how much better an organ from a better donor would be, if she waited?

19:3 And what if that patient could also know exactly how long, if she pas..... (1:1177 [1:1314]) - D 19: Organ donation and AI

And what if that patient could also know exactly how long, if she passes her turn this time, she'd have to wait for an optimal donor?

● **Solution**

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that fa..... (3:2615 [3:3043]) - D 3: Deceased organ donation

Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.

4:6 GREEN COR- RIDOR is an alternative to emergency lanes being im- pleme..... (2:127 [2:301]) - D 4: Green Corridor

GREEN COR- RIDOR is an alternative to emergency lanes being im- plemented to certain extent in India proclaiming the safety of its citizen and provides beter health services

12:4 Multiple steps in the process of deceased organ donation can be targe..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of d..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automa..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

- **Tool(s)**

2 Quotations:

19:4 a risk calculator (1:1922 [1:1939]) - D 19: Organ donation and AI
a risk calculator

20:6 Solution components • IBM® Blueworks Live™ • IBM Business Process Ma..... (3:3139 [3:3260]) - D 20: Maximising patient outcomes (IBM)

Solution components • IBM® Blueworks Live™ • IBM Business Process Manager on Cloud • IBM Operational Decision Manager

20 Maximising patient outcomes (IBM)

4 Codes:

- **Factors**

15 Quotations:

2:12 Recognition of Potential Organ Donor (2:101 [2:136]) - D 2: Organ Donor Problems

Recognition of Potential Organ Donor

2:17 Pathophysiology of Brain Death (2:981 [2:1010]) - D 2: Organ Donor Problems

Pathophysiology of Brain Death

2:18 Intensive Care Management (2:2316 [2:2340]) - D 2: Organ Donor Problems

Intensive Care Management

2:19 Routine Care and Monitoring (2:2696 [2:2722]) - D 2: Organ Donor Problems

Routine Care and Monitoring

2:20 Cardiovascular Support (2:4180 [2:4201]) - D 2: Organ Donor Problems

Cardiovascular Support

2:22 Ventilatory Support (3:2956 [3:2974]) - D 2: Organ Donor Problems

Ventilatory Support

2:23 Renal Support (4:101 [4:113]) - D 2: Organ Donor Problems

Renal Support

2:24 Temperature Regulation (4:3026 [4:3047]) - D 2: Organ Donor Problems

Temperature Regulation

2:25 Coagulation System (4:3655 [4:3672]) - D 2: Organ Donor Problems

Coagulation System

2:26 Endocrine Dysfunction (4:582 [4:602]) - D 2: Organ Donor Problems

Endocrine Dysfunction

2:27 Ischaemia-Reperfusion Injury (4:4353 [4:4380]) - D 2: Organ Donor Problems

Ischaemia-Reperfusion Injury

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6 expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

17:2 1. Positive attitude of public towards organ donation 2. Consent by r..... (1:541 [1:880]) - D 17: Cadaver Organ Donation

1. Positive attitude of public towards organ donation 2. Consent by relatives for organ donation in event of brain death.

3. Successful brain Death identification and certification.

4. Adequate hospital infra-structural and support logistics 5. Successful retrieval and transplantation of organs and auditing long term graft outcomes.

20:2 A range of factors influence those allocation decisions—or allocation..... (2:1187 [2:1578]) - D 20: Maximising patient outcomes (IBM)

A range of factors influence those allocation decisions—or allocation schemes, as they're called—every- thing from the age, size, and clinical condition of the donor and recipient to the unique physiology of each organ type. Medical determinants shaping the development of a suc- cessful kidney allocation scheme, for example, are entirely distinct from those of a heart or liver.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

● **Optimization**

4 Quotations:

19:9 In the long term, he added, "it's not just about prediction (of outco..... (2:3380 [2:3598]) - D 19: Organ donation and AI

In the long term, he added, "it's not just about prediction (of outcomes), it's also about optimization. If our studies lead to better understanding of how these things work, we'll have a brand new set of algorithms

20:1 “Making the most of our donor pool is absolutely critical to saving m..... (2:986 [2:1184]) - D 20: Maximising patient outcomes (IBM)

“Making the most of our donor pool is absolutely critical to saving more lives, and improving our processes for making allocation decisions means we can use more organs than we would otherwise.”

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

29:4 Essential outcomes The solution must: develop a tool that leverages..... (2:872 [2:1728]) - D 29: Machine learning to improve organ donation rates and make better matches

Essential outcomes The solution must: develop a tool that leverages technological approaches in Deep Learning and Artificial Intelligence to: Continually improve the predictive ability of real-time, clinical decision support tools so that it may be used by donation and transplant physicians across Canada to accurately identify candidates that are mostly likely to be successful donors; Personalize kidney transplantation by predicting the success of potential donor- recipient matches and choosing those with the best chances for excellent long-term transplant outcomes; Reduce unsuccessful DCD attempts and improve transplant outcomes, thereby enhancing family experience of donation and optimizing system costs.

develop a tool that is able to match kidneys to transplantation recipients, but is also expandable to other organs, as needed.

● **Solution**

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that fa..... (3:2615 [3:3043]) - D 3: Deceased organ donation

Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.

4:6 GREEN COR- RIDOR is an alternative to emergency lanes being impleme..... (2:127 [2:301]) - D 4: Green Corridor

GREEN COR- RIDOR is an alternative to emergency lanes being im- plemented to certain extent in India proclaiming the safety of its citizen and provides beter health services

12:4 Multiple steps in the process of deceased organ donation can be targe..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of d..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automa..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

● **Tool(s)**

2 Quotations:

19:4 a risk calculator (1:1922 [1:1939]) - D 19: Organ donation and AI

a risk calculator

20:6 Solution components • IBM® Blueworks Live™ • IBM Business Process Ma..... (3:3139 [3:3260]) - D 20: Maximising patient outcomes (IBM)

Solution components • IBM® Blueworks Live™ • IBM Business Process Manager on Cloud • IBM Operational Decision Manager

21 A.I.'s contribution to the global economy

7 Codes:

● **Artificial Intelligence**

5 Quotations:

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

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21:2 AI can already identify potential donors and recipients; in the future..... (2:3001 [3:328]) - D 21: A.I.'s contribution to the global economy

AI can already identify potential donors and recipients; in the future, it will be able to account for even richer patient data, perhaps including moral and religious

12/21/2019 AI and Biotechnology - these two super technologies are combining | World Economic Forum <https://www.weforum.org/agenda/2019/09/artificial-intelligence-meets-biotechnology/> 3/4 factors, to help with sequencing and triage decisions (that is, determining whether someone should get a transplant before someone else).

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:3 While these tools can be used to help improve clinical decisions in donation..... (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

● **Big Data**

1 Quotations:

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

● Green Corridor

5 Quotations:

4:8 The procedure is as follows: 1. When the donor family's consent is co..... (2:712 [2:1371]) - D 4: Green Corridor

The procedure is as follows: 1. When the donor family's consent is confirmed and organs are matched to recipient, the hospital staff gets in touch with police commissioner. This is usually done 2 to 4 hours before the organ is harvested.

2. The traffic police chart the fastest and the most navigable route between the two points.

3. Personnel is placed on different points along the route to blockade the route, manage traffic and make sure that the ambulance does not run into any red light 4. A motorcade of around 4-5 vehicles sets off to the destination. This includes police gypsies as well as additional ambulance as a precaution for breakdown.

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplantation from Apollo hospital, Teynampet, Chennai (south) to Frontier life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemented..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transport of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

● **Insights**

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the n..... (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequelae of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass media..... (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transpl..... (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been international..... (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable..... (1:1761 [1:1943]) - D 12: Deceased organ donation for transplantation

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ tra..... (8:681 [8:929]) - D 12: Deceased organ donation for transplantation

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the countr..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artiŻci..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an

incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● **Problems/Issues**

21 Quotations:

2:2 the predominant limitation to broader application of clinical transp..... (1:1344 [1:1478]) - D 2: Organ Donor Problems

the predominant limitation to broader application of clinical transplantation is the inadequate number of donor organs available.[2]

2:5 non-availability of a suitable donor (1:1630 [1:1666]) - D 2: Organ Donor Problems

non-availability of a suitable donor

2:11 the aim of this review to provide insight into problems of brain dead..... (1:3317 [1:3446]) - D 2: Organ Donor Problems

the aim of this review to provide insight into problems of brain dead donors, their aetiology, pathophysiology and management.

3:2 Lack of effective communication An educated donor who is willing to d..... (2:2606 [2:3202]) - D 3: Deceased organ donation

Lack of effective communication An educated donor who is willing to donate his organs usually has a good knowledge about the concept of 'brain death' and the procedures related to organ donation. He is more likely to effectively communicate with the family members regarding his willingness to donate his organs. Many a times, people sign the donor card due to peer pressure and other factors without having a complete knowledge about the issues involved. These people are less likely to stick to their decision in the future and usually back out from their commitment prior to their death.

3:3 Lack of organizational support The lack of an adequate number of tran..... (2:3203 [2:4064]) - D 3: Deceased organ donation

Lack of organizational support The lack of an adequate number of transplant centers with staff, as well as transplant coordinators who are adequately educated and well-versed with the procedures required to conduct an organ donation program is acting as a significant roadblock to the deceased donation program. Lack of good dialysis programs, research, and effective national health insurance plans, also pose a challenge. Many hospitals do not have a clear protocol for declaring brain death. Some of them also do not have effective transplant coordinators who could sympathetically approach the family members of the brain-dead, potential donor patients, and take consent from them regarding organ donation.

Even the medical community has very little knowledge, and therefore, any efforts made in this direction are thwarted by them to a great extent.

4:1 India's traf problem over the years has been the root cause of many d..... (1:1903 [1:2133]) - D 4: Green Corridor

India's traf problem over the years has been the root cause of many deaths. During an medical emer- gency like organ transplantaton over long distances, the unsuitability of roads and highways hamper in the worst way possible. I

4:3 there is a massive lack of awareness about Green Corridor as well as r..... (1:3729 [1:3920]) - D 4: Green Corridor

there is a massive lack of awareness about Green Corridor as well as reluctance for organ dona- ton. Therefore, awareness should be created on a large scale so that no person is lef oblivious

4:4 India's traf problem has ofen been the cause for many deaths, nearly..... (1:904 [1:1179]) - D 4: Green Corridor

India's traf problem has ofen been the cause for many deaths, nearly 1,50,785 persons were killed in 2016 as against 1,46,133 in 2015 only because ambu- lances couldn't get patents to hospital in tme or worse, ambulances weren't able to reach the accident spots on tme.

4:5 The same applies to organ transplants - hearts and other organs from..... (1:1183 [1:1490]) - D 4: Green Corridor

The same applies to organ transplants - hearts and other organs from brain dead patents sometmes have to be transported over long distances and ofen from other cites. Getng them to patent who needs them in tme is vital for survival. India's overcrowded roads are unsuitable for medical emer- gencies.

8:1 Although the number of patients in the waiting list increases over ti..... (1:244 [1:462]) - D 8: Strategies to optimize deceased organ donation

Although the number of patients in the waiting list increases over time, the number of transplants performed does not increase or increases at a much lower rate because of the scarcity of organs to fulfil the demands.

8:3 Despite these problems, organ transplantation faces an earliest barrier..... (2:1426 [2:1652]) - D 8: Strategies to optimize deceased organ donation

Despite these problems, organ transplantation faces an earliest barrier represented by the important gap existing between the number of patients waiting for a transplant and the number of patients who are indeed transplanted

8:4 The shortage of organs for transplantation may still be underestimate..... (2:2323 [2:2505]) - D 8: Strategies to optimize deceased organ donation

The shortage of organs for transplantation may still be underestimated because the scarcity of organs may preclude physicians from including more patients into the waiting lists.

9:1 With the aim to increase the number of organs for transplantation, national authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

With the aim to increase the number of organs for transplantation, national health authorities face the conundrum of whether they should change from an opt-in to an opt-out consent system or visa-versa, or stick with their current system.

9:2 Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

Inactive deceased or living donor programs Armenia, Azerbaijan, Bangladesh, Egypt, El Salvador, Georgia, India, Libya, Luxembourg, Macedonia

12:1 Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

Organ transplantation saves thousands of lives every year but the shortage of donors is a major limiting factor to increase transplantation rates.

12:2 To allow more patients to be transplanted before they die on the wait-list..... (1:1632 [1:1760]) - D 12: Deceased organ donation for transplantation

To allow more patients to be transplanted before they die on the wait-list an increase in the number of donors is necessary.

12:5 Furthermore, the gap between the number of patients on the wait list..... (2:661 [2:793]) - D 12: Deceased organ donation for transplantation

Furthermore, the gap between the number of patients on the wait list and the limited number of available organs continues to widen.

12:6 Instead, due to the persistent scarcity of organs, a candidate for transplant..... (2:990 [2:1168]) - D 12: Deceased organ donation for transplantation

Instead, due to the persistent scarcity of organs, a candidate for transplant has a 10%-30% chance of dying, depending on the organ, while on the wait list to receive an organ.

12:7 The shortage of organs has been recognized world- wide as a major limiting factor..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

19:6 Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse. (2:859 [2:985]) - D 19: Organ donation and AI

Part of the problem is there's no reliable guide to help transplant physicians and their patients decide to accept or refuse.

21:3 The biggest hurdle preventing these AI models from reaching their full potential..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

● **Solution**

8 Quotations:

3:6 Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility. (3:2615 [3:3043]) - D 3: Deceased organ donation

Green corridors Green corridor refers to a special road route that facilitates the transportation of harvested organs meant for transplantation to the desired hospitals. The street signals are manually operated to avoid stoppage at red lights and to divert the traffic to ensure a rapid transportation of the desired organ. There are many recent instances in India where organs were transported in time using this facility.

4:6 GREEN COR- RIDOR is an alternative to emergency lanes being implemented..... (2:127 [2:301]) - D 4: Green Corridor

GREEN COR- RIDOR is an alternative to emergency lanes being implemented to certain extent in India proclaiming the safety of its citizen and provides better health services

12:4 Multiple steps in the process of deceased organ donation can be targeted..... (1:1945 [1:2077]) - D 12: Deceased organ donation for transplantation

Multiple steps in the process of deceased organ donation can be targeted to increase the number of organs suitable for transplant.

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

20:3 Controlling organ donations nationwide (2:4 [2:43]) - D 20: Maximising patient outcomes (IBM)

Controlling organ donations nationwide

20:4 Using a rule-based platform for organ allocation and process automation..... (2:2837 [2:2910]) - D 20: Maximising patient outcomes (IBM)

Using a rule-based platform for organ allocation and process automation

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

● **Utility**

1 Quotations:

21:4 How will algorithms weigh the needs of poor and wealthy patients? Sho..... (3:1865 [3:2123]) - D 21: A.I.'s contribution to the global economy

How will algorithms weigh the needs of poor and wealthy patients? Should a donor organ be sent to a distant patient – potentially one in a different country – with a low rejection risk or to a nearby patient whose rejection risk is only slightly higher?

24 Blockchain based Organ Transplant Services

8 Codes:

● **Applications**

7 Quotations:

24:2 This will help to reduce this kind of organized crimes, there should..... (7:390 [7:641]) - D 24: Blockchain based Organ Transplant Services

This will help to reduce this kind of organized crimes, there should be effective engagement of public-private partnerships including healthcare and insurance companies for complete success to get rid of these kind of crimes (Alarming Facts, 2019).

24:5 Blockchain technology is incorporated in various domains due to its co..... (10:164 [10:318]) - D 24: Blockchain based Organ Transplant Services

Blockchain technology is incorporated in various domains due to its compelling benefits in improving systems efficiency, transparency, safety and integrity.

24:6 Adopting Blockchain for storing patient's health record data and mana..... (10:700 [10:1122]) - D 24: Blockchain based Organ Transplant Services

Adopting Blockchain for storing patient's health record data and management of medical records will enable patients to control access to their healthcare data. This will eliminate the need to acquiring copies of the healthcare data or sending data to another healthcare provider. Numerous companies are involved in adopting Blockchain technology such as Healthcare Data Gateways (Snow, Deery, Kirby, & Johnston, 2015).

24:8 Based on its practical outcomes, trust in results, integrity and almos..... (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain

technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Blockchain

5 Quotations:

24:4 Before going to implement Blockchain solution we present Blockchain internal architecture, its working and essential components which play important role in building a secure Blockchain solution for organ donation through a track able, secure and unchangeable solution. (7:1634 [7:1908]) - D 24: Blockchain based Organ Transplant Services

Before going to implement Blockchain solution we present Blockchain internal architecture, its working and essential components which play important role in building a secure Blockchain solution for organ donation through a track able, secure and unchangeable solution.

24:8 Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person. (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient. (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations <https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● **Factors**

15 Quotations:

2:12 Recognition of Potential Organ Donor (2:101 [2:136]) - D 2: Organ Donor Problems

Recognition of Potential Organ Donor

2:17 Pathophysiology of Brain Death (2:981 [2:1010]) - D 2: Organ Donor Problems

Pathophysiology of Brain Death

2:18 Intensive Care Management (2:2316 [2:2340]) - D 2: Organ Donor Problems

Intensive Care Management

2:19 Routine Care and Monitoring (2:2696 [2:2722]) - D 2: Organ Donor Problems

Routine Care and Monitoring

2:20 Cardiovascular Support (2:4180 [2:4201]) - D 2: Organ Donor Problems

Cardiovascular Support

2:22 Ventilatory Support (3:2956 [3:2974]) - D 2: Organ Donor Problems

Ventilatory Support

2:23 Renal Support (4:101 [4:113]) - D 2: Organ Donor Problems

Renal Support

2:24 Temperature Regulation (4:3026 [4:3047]) - D 2: Organ Donor Problems

Temperature Regulation

2:25 Coagulation System (4:3655 [4:3672]) - D 2: Organ Donor Problems

Coagulation System

2:26 Endocrine Dysfunction (4:582 [4:602]) - D 2: Organ Donor Problems

Endocrine Dysfunction

2:27 Ischaemia-Reperfusion Injury (4:4353 [4:4380]) - D 2: Organ Donor Problems

Ischaemia-Reperfusion Injury

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

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<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

17:2 1. Positive attitude of public towards organ donation 2. Consent by r..... (1:541 [1:880]) - D 17: Cadaver Organ Donation

1. Positive attitude of public towards organ donation 2. Consent by relatives for organ donation in event of brain death.
3. Successful brain Death identification and certification.
4. Adequate hospital infra-structural and support logistics 5. Successful retrieval and transplantation of organs and auditing long term graft outcomes.

20:2 A range of factors influence those allocation decisions—or allocation..... (2:1187 [2:1578]) - D 20: Maximising patient outcomes (IBM)

A range of factors influence those allocation decisions—or allocation schemes, as they're called—every- thing from the age, size, and clinical condition of the donor and recipient to the unique physiology of each organ type. Medical determinants shaping the development of a suc- cessful kidney allocation scheme, for example, are entirely distinct from those of a heart or liver.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that

particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

● Green Corridor

5 Quotations:

4:8 The procedure is as follows: 1. When the donor family's consent is co..... (2:712 [2:1371]) - D 4: Green Corridor

The procedure is as follows: 1. When the donor family's consent is confirmed and organs are matched to recipient, the hospital staff gets in touch with police commissioner. This is usually done 2 to 4 hours before the organ is harvested.

2. The traffic police chart the fastest and the most navigable route between the two points.

3. Personnel is placed on different points along the route to blockade the route, manage traffic and make sure that the ambulance does not run into any red light 4. A motorcade of around 4-5 vehicles sets off to the destination. This includes police escorts as well as additional ambulance as a precaution for breakdown.

4:9 The green corridor was used for the first time to transport a heart for..... (2:1372 [2:2004]) - D 4: Green Corridor

The green corridor was used for the first time to transport a heart for transplantation from Apollo hospital, Teynampet, Chennai (south) to Frontier life line hospital, Mugappair, and Chennai (west) in 11 minutes which usually would take 45 minutes with coordination of traffic police. [4]. After this incident many states have used this concept of GREEN CORRIDOR to save hundreds of lives. A green corridor was created from Chennai to Bengaluru for heart transplant where a distance of 15.5 km was covered in 14 minutes. [5] These are just the few examples of many successful cases where green corridor helped in saving lives.

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemented..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transportation of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

21:3 The biggest hurdle preventing these AI models from reaching their full..... (3:331 [3:819]) - D 21: A.I.'s contribution to the global economy

The biggest hurdle preventing these AI models from reaching their full potential is biological. In theory, AI applications could draw on data sets encompassing all living and deceased organ donors and all patients worldwide. But, in practice, there is a time limitation on most organ pairings, because organs from deceased

donors are viable for transplantation for only a short period. To be paired, recipients must be located within a geographic radius that can be reached in time.

24:10 In this article, we emphasized the prominent and vital impact of Blockchain..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a tamper-proof feature of recording every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

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Care of the brain-dead donor involves stepping in and reversing the normal sequelae of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

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Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

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An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

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There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

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But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

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Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

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Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

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There is a large pool of cadaver donors available in our country and if this is mobilized, there will not be any need to undertake living organ donation.

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4:2 In a developing unplanned country like India, where lane discipline is..... (1:2133 [1:2415]) - D 4: Green Corridor

In a developing unplanned country like India, where lane discipline is an alien concept, emergency lanes won't sustain as of now. Thus, for provision of better health services, a temporary emergency lane has been implemented in organ transplantation cases known as a 'Green Corridor'

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12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will

also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to effectively combat organ trafficking there is need to increase..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to effectively combat organ trafficking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

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○ **Representation**

7 Quotations:

8:6 Fig. 1. Steps in the process of donation after brain death. (2:3490 [2:3550]) - D 8: Strategies to optimize deceased organ donation

Fig. 1. Steps in the process of donation after brain death.

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Table 2 Economic framework and resources dedicated to health care in European countries (year 2004)

12:8 Figure 1 The gap between organs needed and organs available continues..... (2:4654 [2:4799]) - D 12: Deceased organ donation for transplantation

Figure 1 The gap between organs needed and organs available continues to grow. Available from: URL: [http://www.organdonor.gov/about/data.](http://www.organdonor.gov/about/data.html)

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12:13 BD: Brain death; OPTN: Organ Procurement Transplantation Network. (4:5822 [4:5888]) - D 12: Deceased organ donation for transplantation

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12:15 Figure 2 The number of actual organ donors is only a small proportion..... (5:3923 [5:4093]) - D 12: Deceased organ donation for transplantation

Figure 2 The number of actual organ donors is only a small proportion of the pool of deaths. A: Total deaths; B: Imminent deaths; C: Eligible deaths; D: Actual donors.

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24:9 Figure 10. Sequence Diagram for Organ donation system. (15:1825 [15:1878]) - D 24: Blockchain based Organ Transplant Services

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● **Tracking**

5 Quotations:

24:6 Adopting Blockchain for storing patient's health record data and mana..... (10:700 [10:1122]) - D 24: Blockchain based Organ Transplant Services

Adopting Blockchain for storing patient's health record data and management of medical records will enable patients to control access to their healthcare data. This will eliminate the need to acquiring copies of the healthcare data or sending data to another healthcare provider. Numerous companies are involved in adopting Blockchain technology such as Healthcare Data Gateways (Snow, Deery, Kirby, & Johnston, 2015).

24:7 There is a huge gap between healthcare providers and end users because..... (11:2307 [11:2490]) - D 24: Blockchain based Organ Transplant Services

There is a huge gap between healthcare providers and end users because of non-transparent information exchange which ultimately affects the entire healthcare including medical system.

24:8 Based on its practical outcomes, trust in results, integrity and almos..... (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

32:1 Ahead of an organ being removed from the donor, complete consensus must..... (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this

point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ

25 A.I. in Organ Transplants

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12:12 Although the plain application of the Spanish model to other national..... (3:5000 [3:5386]) - D 12: Deceased organ donation for transplantation

Although the plain application of the Spanish model to other national donation systems would not necessarily lead to increased donation rates due to several socio- economic and cultural differences between countries, nonetheless the Spanish experience in recent decades and published studies from other countries indicate that the donor potential is probably not fully exploited.

19:8 "For patients, it will mean a big change. If they say 'no' to a donat..... (2:3088 [2:3377]) - D 19: Organ donation and AI

"For patients, it will mean a big change. If they say 'no' to a donation, they'll be able to know what their chances are of getting a better one if they wait. And it will also mean there's a better chance that the organ they refuse will go to somebody else who is better suited to it."

24:1 In order to effectively combat organ trafficking there is need to increase..... (7:118 [7:388]) - D 24: Blockchain based Organ Transplant Services

In order to effectively combat organ trafficking there is need to increase its visibility by complete tracking record of organs starting from donor till recipients, every step should be documented with some reference number, fully hashed with time stamp and unchangeable.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27 How AI changed organ donation

4 Codes:

● **Algorithms**

4 Quotations:

27:1 Paired kidney donation is one of the great success stories of artiŻci..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:2 a tool that provides a standardized and personalized assessment of do..... (1:1054 [1:1322]) - D 29: Machine learning to improve organ donation rates and make better matches

a tool that provides a standardized and personalized assessment of donor and organ suitability to make decisions about organ retrieval; and, a similar tool that helps kidney failure patients determine if they should accept the donor kidney or wait for a better match

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached..... (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this

point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Insights

16 Quotations:

2:28 Care of the brain-dead donor involves stepping in and reversing the normal sequence of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period. (5:437 [5:797]) - D 2: Organ Donor Problems

Care of the brain-dead donor involves stepping in and reversing the normal sequence of brain death, that ultimately results in somatic death. The aim is to support the body function with adequate oxygenation and tissue perfusion, till organs are retrieved, because the success of the transplant depends on quality of donor care during this critical period.

8:2 Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results. (1:1443 [1:1681]) - D 8: Strategies to optimize deceased organ donation

Great effort in training and education, close attention to the mass media, and reimbursement to procurement and transplant centers for the developed activity have been other measures indeed contributing to the successful Spanish results.

8:9 Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media (5:2795 [5:3258]) - D 8: Strategies to optimize deceased organ donation

Table 1 Principles of the Spanish Model of Organ Donation 1. Transplant coordination network 2. Special profile of the 3 levels of transplant coordination 3. Continuous audit on brain deaths and outcome of donation at ICUs in transplant procurement hospitals 4. Central office as an agency in support of all the process of donation (besides organ sharing) 5. Great effort in medical training 6. Hospital reimbursement 7. Close attention to the mass media

8:14 Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation. (11:3433 [11:3653]) - D 8: Strategies to optimize deceased organ donation

Organization is in fact the whole philosophy of what it has been internationally known as the Spanish Model of Organ Donation, a model that has led Spain in an outstanding position when referring to deceased donation.

12:3 Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors. (1:1761 [1:1943]) - D 12: Deceased organ donation for transplantation

Patients with devastating irreversible brain injury, if medically suitable, are potential deceased donors and strategies are needed to successfully convert them into actual donors.

12:9 Subsequently, the Institute of Medicine (IoM) published the document..... (2:2598 [2:3188]) - D 12: Deceased organ donation for transplantation

Subsequently, the Institute of Medicine (IoM) published the document “Organ Donation: Opportunities for Action”[8]. This report emphasized that the current system of organ donation could be greatly improved and offered a number of specific recommendations to help increase the supply of transplantable organs. Given the wide variation in consent rate, ranging between 30% and 70%, across Organ Procurement Organizations (OPO), the IoM recommended the identification of best practices and their dissemination among institutions in the organ- procurement and transplantation system.

12:14 Although the true potential could have been over-estimated due to the..... (4:3223 [4:3593]) - D 12: Deceased organ donation for transplantation

Although the true potential could have been over-estimated due to the lack of more detailed medical information, nevertheless this study confirms that there is an untapped pool of potential donors. Another interesting finding in this study was that, among people who met basic medical criteria for deceased donation, the actual donation rate was considerably lower

12:17 An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates. (8:681 [8:929]) - D 12: Deceased organ donation for transplantation

An increase in deceased organ donation is necessary to make organ transplantation accessible to more candidates. Among others, new strategies to manage the pool of potential donors are needed in order to increase donation rates.

ACKNOWLEDGMENTS

17:5 There is potentially a huge pool of brain-death patients in the country..... (2:5965 [2:6225]) - D 17: Cadaver Organ Donation

There is potentially a huge pool of brain-death patients in the country who could not only meet the local demands of organs but may be able to meet the needs of some of the neighboring countries which sometimes looks towards India for their healthcare needs.

21:1 But with enough patients and willing donors, Big Data and AI make it p..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:5 combination technologies up and working, and then decide on the appro..... (3:2188 [3:2514]) - D 21: A.I.'s contribution to the global economy

combination technologies up and working, and then decide on the appropriate controls. The matching power of AI means that eight lives could be saved by just one deceased organ donor; innovations in biotechnology could ensure that organs are never wasted. The faster these technologies advance, the more lives we can save.

24:3 Consider a patient with wearable sensors that record any change in the..... (7:908 [7:1633]) - D 24: Blockchain based Organ Transplant Services

Consider a patient with wearable sensors that record any change in the patient health-such as-high blood pressure, heart attack, faintness, blood sugar level etc. The sensors send the information to cloud storage, where analytical procedures are built, and other data related to the patient such as his medical history is already saved. Real-time data from the sensors and the historical data from the cloud is used to conduct classification and predication of the patient's case. These findings are sent to a monitoring doctor that can get alert of the changes in condition of that particular patient. It works in a reverse order to keep track of all the all phases during from start till current status of transaction.

24:10 In this article, we emphasized the prominent and vital impact of Block..... (20:1347 [20:2400]) - D 24: Blockchain based Organ Transplant Services

In this article, we emphasized the prominent and vital impact of Blockchain technology and its effective use in the entire healthcare sector (i.e. from manufacturer till patients) by highlighting the hurdles in facilitating a clear exchange of information from origin till its destination and also discussed the role of Blockchain technology in solving problems related to grey market of organ donation and other related issues to help every stakeholder for making better-informed decisions. Based on our findings during this research we can conclude that use of Blockchain is going to be a must for any critical medical services and their tracking. As Blockchain can provide a temper-proof feature of recording

every transmission in the digital communication, it will allow the saved data to be viewed publicly with no alteration risk by accomplishing decentralized agreements. Since health information of any person is very personal stuff which cannot be shared publicly so there is great need to address secrecy of individual health records.

25:1 Researchers have already begun to evaluate the feasibility of machine..... (4:1130 [4:1681]) - D 25: A.I. in Organ Transplants

Researchers have already begun to evaluate the feasibility of machine learning for organ allocation, demonstrating the accuracy of model estimations of up to 87% [6]. In an effort to illicit patterns from millions of past clinical decisions, surgical outcomes, and patient demographics, AI-based algorithms are beginning to provide insights that would give DonorNet the capability to provide patients and surgeons highly comprehensive decision metrics based on macro-level trends that are nearly impossible to study based on current techniques.

27:1 Paired kidney donation is one of the great success stories of artificial..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

○ **Intensivist**

3 Quotations:

2:10 the intensivist can play a very crucial role by converting a potential..... (1:3209 [1:3308]) - D 2: Organ Donor Problems

the intensivist can play a very crucial role by converting a potential donor into an actual donor.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

● Limitations

3 Quotations:

2:6 lack of well-developed cadaver programme. (1:1688 [1:1729]) - D 2: Organ Donor Problems

lack of well-developed cadaver programme.

12:7 The shortage of organs has been recognized world- wide as a major lim..... (2:1587 [2:1696]) - D 12: Deceased organ donation for transplantation

The shortage of organs has been recognized world- wide as a major limiting factor to organ transplantation.

27:2 A machine can be taught to make matches in line with our value system..... (18:1171 [18:1519]) - D 27: How AI changed organ donation

A machine can be taught to make matches in line with our value system, but we don't always understand what our own values are, or agree on them as a group. People don't always know what they want to optimize for, and even when they think they do, they often don't understand how to do it in a way that doesn't lead to unintended consequences.

29 Machine learning to improve organ donation rates and make better matches

6 Codes:

● Algorithms

4 Quotations:

27:1 Paired kidney donation is one of the great success stories of artificial intelligence. (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artificial intelligence. It doesn't eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the first paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identified by algorithms. T

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:2 a tool that provides a standardized and personalized assessment of do..... (1:1054 [1:1322]) - D 29: Machine learning to improve organ donation rates and make better matches

a tool that provides a standardized and personalized assessment of donor and organ suitability to make decisions about organ retrieval; and, a similar tool that helps kidney failure patients determine if they should accept the donor kidney or wait for a better match

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached. (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 100 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Applications

7 Quotations:

24:2 This will help to reduce this kind of organized crimes, there should..... (7:390 [7:641]) - D 24: Blockchain based Organ Transplant Services

This will help to reduce this kind of organized crimes, there should be effective engagement of public-private partnerships including healthcare and insurance companies for complete success to get rid of these kind of crimes (Alarming Facts, 2019).

24:5 Blockchain technology is incorporated in various domains due to its co..... (10:164 [10:318]) - D 24: Blockchain based Organ Transplant Services

Blockchain technology is incorporated in various domains due to its compelling benefits in improving systems efficiency, transparency, safety and integrity.

24:6 Adopting Blockchain for storing patient's health record data and management..... (10:700 [10:1122]) - D 24: Blockchain based Organ Transplant Services

Adopting Blockchain for storing patient's health record data and management of medical records will enable patients to control access to their healthcare data. This will eliminate the need to acquiring copies of the healthcare data or sending data to another healthcare provider. Numerous companies are involved in adopting Blockchain technology such as Healthcare Data Gateways (Snow, Deery, Kirby, & Johnston, 2015).

24:8 Based on its practical outcomes, trust in results, integrity and almos..... (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in

the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Artificial Intelligence

5 Quotations:

19:7 Machine learning is very well designed to crunch huge quantities of data..... (2:2555 [2:2672]) - D 19: Organ donation and AI

Machine learning is very well designed to crunch huge quantities of data and do with it with much greater certainty,

21:1 But with enough patients and willing donors, Big Data and AI make it possible..... (2:2167 [2:2771]) - D 21: A.I.'s contribution to the global economy

But with enough patients and willing donors, Big Data and AI make it possible to facilitate far more matches than this one-to-one system allows, through a system of paired kidney donation.

Patients can now procure a donor who is not a biological fit and still receive a kidney, because AI can match donors to recipients across a massive array of patient-donor relationships. In fact, a single person who steps forward to donate a kidney – either to a loved one or even to a stranger – can set off a domino effect that saves dozens of lives by resolving the missing link in a long chain of pairings.

21:2 AI can already identify potential donors and recipients; in the future..... (2:3001 [3:328]) - D 21: A.I.'s contribution to the global economy

AI can already identify potential donors and recipients; in the future, it will be able to account for even richer patient data, perhaps including moral and religious

12/21/2019 AI and Biotechnology - these two super technologies are combining | World Economic Forum <https://www.weforum.org/agenda/2019/09/artificial-intelligence-meets-biotechnology/> 3/4 factors, to help with sequencing and triage decisions (that is, determining whether someone should get a transplant before someone else).

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:3 While these tools can be used to help improve clinical decisions in d..... (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-transplant recipient matches.

● **Machine Learning**

2 Quotations:

29:5 Machine learning to improve organ donation rates and make better match..... (1:277 [1:349]) - D 29: Machine learning to improve organ donation rates and make better matches

Machine learning to improve organ donation rates and make better matches

29:6 Deep Learning (1:491 [1:504]) - D 29: Machine learning to improve organ donation rates and make better matches

Deep Learning

● **Optimization**

4 Quotations:

19:9 In the long term, he added, "it's not just about prediction (of outcomes)..... (2:3380 [2:3598]) - D 19: Organ donation and AI

In the long term, he added, "it's not just about prediction (of outcomes), it's also about optimization. If our studies lead to better understanding of how these things work, we'll have a brand new set of algorithms

20:1 "Making the most of our donor pool is absolutely critical to saving more lives..... (2:986 [2:1184]) - D 20: Maximising patient outcomes (IBM)

"Making the most of our donor pool is absolutely critical to saving more lives, and improving our processes for making allocation decisions means we can use more organs than we would otherwise."

20:5 Optimising transplant outcomes (3:1 [3:31]) - D 20: Maximising patient outcomes (IBM)

Optimising transplant outcomes

29:4 Essential outcomes The solution must: develop a tool that leverages..... (2:872 [2:1728]) - D 29: Machine learning to improve organ donation rates and make better matches

Essential outcomes The solution must: develop a tool that leverages technological approaches in Deep Learning and Artificial Intelligence to: Continually improve the predictive ability of real-time, clinical decision support tools so that it may be used by donation and transplant physicians across Canada to accurately identify candidates that are mostly likely to be successful donors; Personalize kidney transplantation by predicting the success of potential donor- recipient matches and choosing those with the best chances for excellent long-term transplant outcomes; Reduce unsuccessful DCD attempts and improve transplant outcomes, thereby enhancing family experience of donation and optimizing system costs.

develop a tool that is able to match kidneys to transplantation recipients, but is also expandable to other organs, as needed.

● **Type**

5 Quotations:

10:2 In the past, death was thought to occur when the person stopped breath..... (1:2227 [1:2748]) - D 10: Organ Donation Process

In the past, death was thought to occur when the person stopped breathing and their heart also stopped. Advances in medical science now allow us to artificially support the breathing and blood pressure of a patient. This means that we now have two ways to define death: 1. Cardiovascular death- which occurs when the heart stops beating and there is no breathing.

2. Brain death - which occurs when the brain stops working, but the heart is still beating and the person breathes with the use of a breathing machine.

12:10 Brain dead donors The vast majority (80%-90%) of organs from DD are..... (2:3741 [2:4314]) - D 12: Deceased organ donation for transplantation

Brain dead donors The vast majority (80%-90%) of organs from DD are procured after declaration of death by neurologic criteria (or “brain death”, BD). Brain death is determined after irreversible cessation of brain stem activity documented by bedside neurologic tests (reflexes, Table 1).

The oxygenation of a comatose person who suffered a devastating irreversible brain injury fulfilling the criteria for brain death is maintained by mechanical ventilation, while cardio-circulatory activity and organ perfusion is supported, if needed, by inotropic medications.

12:11 Donation after cardiac death Unlike BD donors, a proportion of DD, cu..... (3:1 [3:672]) - D 12: Deceased organ donation for transplantation

Donation after cardiac death Unlike BD donors, a proportion of DD, currently 16% of the organs procured nationally, are recovered after declaration of death by circulatory criteria [donation after cardiac death (DCD)][9]. In this scenario, patients who have suffered severe brain injury but do not fulfill the criteria for brain death, may still be organ donors if the patient, by advance directive, or the patient's family decides to withdraw life support. In these circumstances, after consent for organ donation has been obtained, the patient is brought to the operating room where ventilation is disconnected and life-sustaining medications are withdrawn.

13:1 There are two types of organ donation in BC—deceased donation and living donation. (1:121 [1:1128]) - D 13: Deceased Donation

There are two types of organ donation in BC—deceased donation and living donation.

In order to be a deceased organ donor in BC, a person needs to be in an intensive care unit (ICU) and on a ventilator (breathing machine). Donation is only considered after all life-saving methods to save a patient's life have been tried.

There are two types of donation after death: Neurological determination of death (also referred to as "brain death") means the brain has permanently lost all function and a diagnosis of death using neurological criteria has been determined.

For more information on NDD, please see 'Organ Donation after Brain Death'.

Donation after Circulatory Death (DCD) is an option for organ donation for patients with severe brain injuries once a decision has been made to remove all life-sustaining treatments. When a person's heart permanently stops beating, they have experienced Circulatory Death.

For more information on DCD, please see 'Organ Donation after Circulatory Death'.

29:3 While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-recipient matches (1:1325 [1:1666]) - D 29: Machine learning to improve organ donation rates and make better matches

While these tools can be used to help improve clinical decisions in donation and transplantation, AI experts are needed to use Deep Learning to continually enhance the predictive ability of these tools towards improved circulatory determined death (DCD) donation rates and to identify the best potential donor-recipient matches.

30 Medical Management of Organ Donors

1 Codes:

● Management

5 Quotations:

30:1 Temperature Management Prevention of hypothermia should be preferred..... (4:3854 [4:4456]) - D 30: Medical Management of Organ Donors

Temperature Management Prevention of hypothermia should be preferred compared with its reversal. It is easier to prevent hypothermia by actively warming the donor body, and bodies with temperatures $<34^{\circ}\text{C}$ should be subjected to core warming [36]. Surface warming should be performed for all patients with hypothermia and should be continued to maintain a temperature over 35.8°C before and during the retrieval operation [28,44]. Active warming can be achieved using warm blankets, fluid warmers, and heated humidifiers in ventilator circuits [39], as well as by adjusting the ambient temperature.

30:2 Cardiovascular Management Hemodynamic goals Goals for the management..... (4:4466 [4:5141]) - D 30: Medical Management of Organ Donors

Cardiovascular Management Hemodynamic goals Goals for the management of hemodynamic status in donors are as follows [5]: (1) to maintain normovolemia; (2) to control blood pressure (BP); (3) to optimize cardiac output (CO) to maintain perfusion pressure of all organs; and (4) to minimize use of vasoactive agents. Although some consensus recommendations have been made (Table 2) [20,45], currently, there is still a lack of clear evidence for recommendations on ideal hemodynamic goals in organ donor management. Logically, recommendations on BP values should be individualized; for example, higher BP targets for potential organ donors with known hypertension [20].

30:3 Renal Changes Experimental models have demonstrated that biomarkers f..... (3:2372 [3:2999]) - D 30: Medical Management of Organ Donors

Renal Changes Experimental models have demonstrated that biomarkers for renal tubular injuries may be elevated as early as 30 minutes after the onset of brain death [20]. Both proinflammatory and procoagulant effects caused by brain death have been identified as main contributing factors [20]. Pretransplant kidney biopsies of a brain-dead donor found that the kidneys contain more infiltrating T lymphocytes and macrophages compared to those from living and cardiac-dead donors. There is also compelling evidence showing a greater release of inflammatory cytokines during reperfusion in brain-dead donor kidneys [27].

30:4 Respiratory Changes The lungs are the organs most often assumed to be..... (3:660 [3:988]) - D 30: Medical Management of Organ Donors

Respiratory Changes The lungs are the organs most often assumed to be medically unsuitable for transplants, with only 10%–20% of lungs eligible for transplantation [23]. Neurogenic pulmonary edema (NPE) and inflammatory acute

lung injury are the two main factors related to brain-death-induced lung injury and dysfunction [24]

30:5 Cardiovascular Changes In a brain-dead patient, ICP rises, which comp..... (2:3187 [2:3933]) - D 30: Medical Management of Organ Donors

Cardiovascular Changes In a brain-dead patient, ICP rises, which compromises cerebral blood flow and causes hemodynamic changes, described as the “Cushing reflex,” which is a mixed picture of vagal and sympathetic stimulation. As pontine ischemia develops, it clinically manifests as bradycardia and hypertension [20]. When blood supply is further compromised, ischemia progresses to the medulla oblongata, involving the vagal motor nucleus [20]. This results in compensatory arterial hypertension, perhaps associated with bradycardia, followed by marked sympathetic stimulation with intense vasoconstriction, raised systemic vascular resistance, and tachycardia [2]. This clinical picture is known as the “catecholamine storm,” and these fe

32 Blockchain & Health

7 Codes:

● Algorithms

4 Quotations:

27:1 Paired kidney donation is one of the great success stories of artiŻci..... (2:1308 [2:1772]) - D 27: How AI changed organ donation

Paired kidney donation is one of the great success stories of artiŻcial intelligence. It doesn’t eliminate jobs or scrub the human touch from medical care. It takes an incredibly complex problem and solves it faster and with fewer errors than humans can, and as a result saves more lives. Since the Żrst paired kidney exchange surgeries took place in 2000, nearly 6,000 people have received kidney transplants from paired exchanges identiŻed by algorithms. T

29:1 Artificial Intelligence (AI) is poised to transform the field of organ..... (1:892 [1:990]) - D 29: Machine learning to improve organ donation rates and make better matches

Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

29:2 a tool that provides a standardized and personalized assessment of do..... (1:1054 [1:1322]) - D 29: Machine learning to improve organ donation rates and make better matches

a tool that provides a standardized and personalized assessment of donor and organ suitability to make decisions about organ retrieval; and, a similar tool that

helps kidney failure patients determine if they should accept the donor kidney or wait for a better match

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to 100,000 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

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A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

12/21/2019 Someone could die: Blockchain in the highest trust situations
<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Applications

7 Quotations:

24:2 This will help to reduce this kind of organized crimes, there should be effective engagement of public-private partnerships including healthcare and insurance

This will help to reduce this kind of organized crimes, there should be effective engagement of public-private partnerships including healthcare and insurance

companies for complete success to get rid of these kind of crimes (Alarming Facts, 2019).

24:5 Blockchain technology is incorporated in various domains due to its co..... (10:164 [10:318]) - D 24: Blockchain based Organ Transplant Services

Blockchain technology is incorporated in various domains due to its compelling benefits in improving systems efficiency, transparency, safety and integrity.

24:6 Adopting Blockchain for storing patient's health record data and mana..... (10:700 [10:1122]) - D 24: Blockchain based Organ Transplant Services

Adopting Blockchain for storing patient's health record data and management of medical records will enable patients to control access to their healthcare data. This will eliminate the need to acquiring copies of the healthcare data or sending data to another healthcare provider. Numerous companies are involved in adopting Blockchain technology such as Healthcare Data Gateways (Snow, Deery, Kirby, & Johnston, 2015).

24:8 Based on its practical outcomes, trust in results, integrity and almos..... (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

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Artificial Intelligence (AI) is poised to transform the field of organ donation and transplantation

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature

throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

Blockchain is not the magic bullet to address all organ donation woes. Issues around supply, incomplete medical records, lack of effective algorithms matching donors to recipients, and many more continue to plague the system. But it would present a good first step to bridging the nodes of a dispersed and complex system.

When we speak about a secure, distributed, shared ledger in our day to day transactions, the applications may seem abstract, but in one of our most critical supply chains the applications become significantly more self-evident. Consider similar applications in your day to day operations, where you may also require: A highly transactional process or item, with many parties operating across many systems and platforms Complete agreement and alignment between all parties in the process Real-time insights into the state of the transaction An auditable transaction record that spans the full life of the transaction, regardless of how long it takes or how many transactions are enacted on it A way to associate multiple types of data / set data ownership to the transaction Complete privacy and data security

● Blockchain

5 Quotations:

24:4 Before going to implement Blockchain solution we present Blockchain internal architecture, its working and essential components which play important role in building a secure Blockchain solution for organ donation through a track able, secure and unchangeable solution. (7:1634 [7:1908]) - D 24: Blockchain based Organ Transplant Services

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● Conditions

21 Quotations:

2:13 Any comatose patient with a known aetiology of irreversible cerebral..... (2:139 [2:980]) - D 2: Organ Donor Problems

Any comatose patient with a known aetiology of irreversible cerebral damage who is likely to progress to brain death prior to terminal circulatory arrest, should be considered a potential organ donor. The absolute contraindications are: • Uncontrolled sepsis • Active viral infection - Hepatitis B and C, CMV, Herpes simplex • HIV-positive serology • Malignancy (except primary intracranial tumor, non melanotic skin cancer and Ca-cervix in situ) Ideally, the donor should be less than 60 years of age, without end organ damage from systemic disease, but these criteria have been liberalized, considering organ shortage.[6] Besides these general criteria, it is important to determine the intrinsic function of the organs to be transplanted and to ascertain that the illness has not impaired these organs irreversibly.

2:14 Brain death is a catastrophic physiological event, associated with si..... (2:1013 [2:1482]) - D 2: Organ Donor Problems

Brain death is a catastrophic physiological event, associated with significant deterioration in the function of the organs distant from the brain. These changes occur due to the process of brain dying, as well as due to loss of integrated neurological function, with its central role in the coordination of autonomic and other basic organ functions. Even with maximal support, cardio-respiratory deterioration leading to somatic death will occur within days.[7,8]

2:15 The most important goals in the management of brain dead organ donors..... (2:2343 [2:2695]) - D 2: Organ Donor Problems

The most important goals in the management of brain dead organ donors are: hemodynamic stability and support of body homeostasis until the organs are retrieved. There is a shift in emphasis from cerebral protection with its usual accompaniment of intravascular volume depletion, to the optimization of organ perfusion and tissue oxygen delivery.

2:16 Regular nursing care must be continued after brain death. Frequent tu..... (2:2725 [2:3615]) - D 2: Organ Donor Problems

Regular nursing care must be continued after brain death. Frequent turning of patient for decubitus ulcer prophylaxis, skin care, dressing changes, urinary and intravascular catheter care, must be meticulous to minimize the risk of infection. A nasogastric tube must be inserted for gastric decompression and prevention of aspiration. If necessary, arterial and central venous lines should be inserted into the upper extremities, because femoral line readings can become inaccurate during surgical procedure for organ procurement.[11] Routine monitoring includes ECG, blood pressure, pulse oximetry, core temperature, U/O and central venous pressure. Use of a Swan-Ganz catheter for measurement of pulmonary capillary wedge pressure and pulmonary venous oxymetry, should be reserved for unstable donors, who have persistent acidosis with evidence of tissue hypoperfusion.[12]

2:21 Hypotension is the most common hemodynamic abnormality observed in up..... (2:4204 [2:4460]) - D 2: Organ Donor Problems

Hypotension is the most common hemodynamic abnormality observed in upto 91% of brain-dead organ donors.[14] The contributing factors are multifactorial and include hypovolaemia, damage to vasomotor centre, left heart dysfunction and endocrine failure.

2:29 After brain death is declared, vigorous tracheobronchial toilet is im..... (3:2977 [3:3230]) - D 2: Organ Donor Problems

After brain death is declared, vigorous tracheobronchial toilet is important with frequent suctioning, using sterile precautions. The lungs must be inflated by manual inflation at regular intervals, to minimize the risk of atelectasis and infection.

2:30 Brain dead donors can develop respiratory alkalosis secondary to mech..... (3:4038 [3:4570]) - D 2: Organ Donor Problems

Brain dead donors can develop respiratory alkalosis secondary to mechanical hyperventilation as a part of treatment protocol for elevated intracranial pressure, or lactic metabolic acidosis due to dehydration or tissue ischaemia. Both have deleterious effect on tissue oxygen delivery; hence, arterial pH should be adjusted to normal values. Treatment is first directed towards correcting cause, changing ventilatory parameters and finally pharmacological agents are administered to correct the calculated acid-base deficit.

2:31 Hyperglycemia in brain-dead donors may be due to stress, catecholamin..... (4:1873 [4:2146]) - D 2: Organ Donor Problems

Hyperglycemia in brain-dead donors may be due to stress, catecholamine-induced insulin resistance, steroid administration for treatment of cerebral edema, or infusion of large amounts of dextrose-containing IV fluids.

There is no evidence of pancreatic endocrine failure

2:32 After brain death, the body becomes poikilothermic, because of loss o..... (4:3050 [4:3404]) - D 2: Organ Donor Problems

After brain death, the body becomes poikilothermic, because of loss of thalamic and hypothalamic central temperature control mechanisms. Systemic vasodilatation, administration of cold IV fluids and blood products, will further aggravate the problem. Hypothermia can lead to cardiac irritability, coagulopathy and reduce oxygen delivery to tissues. I

2:33 Coagulopathy and disseminated intravascular coagulation are not uncom..... (4:3675 [4:4016]) - D 2: Organ Donor Problems

Coagulopathy and disseminated intravascular coagulation are not uncommon findings in brain-dead donors, particularly in head injury patients, due to release of thromboplastin from the injured brain.[41,42] Other reasons are dilutional coagulopathy due to large volume resuscitation, massive blood transfusion for trauma, or hypothermia.

2:34 Brain death is also proposed to induce organ dysfunction via ischemia..... (4:4383 [5:240]) - D 2: Organ Donor Problems

Brain death is also proposed to induce organ dysfunction via ischemia reperfusion injury, due to vasoconstriction and low flow associated with autonomic storm, followed by vasodilatation and reflow. Recent studies suggest that there is up-regulation of 32

IJCCM October-December 2003 Vol 7 Issue 4 Indian J Crit Care Med January-March 2006 Vol 10 Issue 1 inflammatory cytokines, increased expression of cell adhesion molecule/antigen and widespread microvascular and endothelial changes.[43,44

2:35 Maintaining adequate systemic perfusion pressure and brisk urine outp..... (4:116 [4:579]) - D 2: Organ Donor Problems

Maintaining adequate systemic perfusion pressure and brisk urine output (>1 - 2 ml/kg/hr), while minimizing the use of vasopressors, contributes to good renal allograft function.[12] If urine output is less (<1 ml/kg/hr) after adequate volume loading, loop diuretics (furosemide), or osmotic diuretics (mannitol) should be used. Use of nephrotoxic drugs (aminoglycosides) and agents that adversely affect renal perfusion (e.g. NSAIDs), should be avoided.[12]

8:7 2.1. Donor identification All potential donors should be identified a..... (3:1 [3:2274]) - D 8: Strategies to optimize deceased organ donation

2.1. Donor identification All potential donors should be identified at the earliest stage as possible. This early identification will facilitate donor screening and maintenance but undoubtedly implies a proactive attitude at this first and crucial step.

2.2. Donor screening The risk of transmission of a serious disease through organ transplantation (neoplasia and infection) from the donor to the recipient should be minimized. However, it must be ensured that only organs that should be discarded are so, avoiding an unjustified loss of organs.

2.3. Donor maintenance It is essential that organs procured are kept in adequate conditions before retrieval. The maintenance of the potential donor's physiological state while on intensive care and of the donor before and during retrieval can make a major difference to the condition of the organs. Poor donor maintenance can make organs unusable or increase the incidence of primary graft failure.

2.4. Consent/authorization Appropriate consent or authorization has to be obtained before organs can be removed. Countries have different legal requirements to obtain consent: although some countries apply the presumed consent (or opting-out approach), in others, specific consent (opting-in approach) has to be expressed.

2.5. Organ retrieval The surgical technique for removing organs from the body and the way those organs are subsequently handled and preserved before and during transportation are critical to the successful outcome of the transplant. Each year, several organs are damaged during removal and/or transportation.

Some can be repaired, but a few will have to be discarded.

Coordination of retrieval activities is needed to guarantee the success of the process.

2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between trans-plant organizations and countries. Cooperation between countries is increasingly important

10:1 Brain Death Brain Death occurs when: 1. The patient is in a state wh..... (1:851 [1:2219]) - D 10: Organ Donation Process

Brain Death Brain Death occurs when: 1. The patient is in a state where they will never wake up.

2. The patient loses all vital functions of the brain, which includes the ability to ever breathe on their own.

Brain death means that a person is dead even though their heart continues to beat and breathing is made possible by use of a breathing tube and a breathing machine. A series of tests are done by two doctors who are experts in the field of brain injury to confirm that the patient is brain dead.

There are times when this series of brain death tests cannot be performed, and a more highly specialized test is needed called a CT Angiogram. A CT Angiogram test looks to see if blood is flowing in the brain. If blood is not flowing in the brain, the person is brain dead.

Brain death may be difficult for family members to understand because their loved one is being supported by machines, and looks as if he/she is asleep. Brain death is not the same as a coma where some brain function is still present.

In the case of brain death, blood is still flowing to other body organs such as the heart, lungs, liver, kidneys, small bowel and pancreas. Once the patient's family makes the final decision to donate, these organs may be transplanted into another person as long as the organs are working properly; and there are no serious health concerns.

10:3 Family Consent Once brain death has happened, the Donor Coordinator w..... (2:791 [2:1433]) - D 10: Organ Donation Process

Family Consent Once brain death has happened, the Donor Coordinator will meet with the family to provide information on organ donation in a sensitive and supportive manner. During the meeting with the family, the patient remains on a breathing machine and can be given medications while the family is making a decision. The decision can be easier and less stressful for the family if they have already talked about organ donation before.

The family may give consent for which organs they wish to donate during this meeting.

Once a decision has been made by the family, then they can go forward and make all of the funeral arrangements.

10:4 Suitability A series of tests and exams are then performed to assess..... (2:1434 [2:2132]) - D 10: Organ Donation Process

Suitability A series of tests and exams are then performed to assess the organs being offered for transplant. These tests and exams determine how stable the donor is, if the organs are working properly, and if there is any risk of diseases

being transmitted from the donor to the person receiving the organ. Even if the organs were healthy and strong in life, the process of brain death can cause injury to the organs, which can make them unfit for transplant.

To ensure the health and safety of the person receiving the organ (recipient), a review of the donor's medical and social history is carried out with the family using a detailed questionnaire. The questions asked are similar to the

10:5 Organ Placement Donated organs are matched to recipients based on: bl..... (2:2244 [2:2775]) - D 10: Organ Donation Process

Organ Placement Donated organs are matched to recipients based on: blood type, height, weight, and how sick the recipient is, and how long they have been waiting for a transplant. The most suitable recipient for each organ is identified before that organ is removed, because organs cannot be stored for long periods of time outside the body. Finally, for the best match of an organ to a recipient, a special blood test called HLA typing (DNA/ genetic test) is done to see which recipient would have the least chance of rejection

10:6 Organ Recovery The donor is taken to the operating room once all of t..... (2:2898 [2:3197]) - D 10: Organ Donation Process

Organ Recovery The donor is taken to the operating room once all of the tests are completed, recipients have been chosen, and the transplant teams are assembled. The donor surgery takes place in the same manner as any other surgery. The donor's organs are removed and transplanted without delay.

10:7 After Organs Have Been Recovered The donor is kept at the hospital un..... (2:3198 [3:453]) - D 10: Organ Donation Process

After Organs Have Been Recovered The donor is kept at the hospital until he/she can be taken to the funeral home. Organ donation should not delay any funeral arrangements. However, as with all hospital deaths the Medical Examiner must review the hospital chart before making the decision to release the body. An open-casket funeral is still an option for the family.

/ Follow-Up After donation has occurred, the family is contacted by telephone to tell them which organs were recovered for transplant or research. The family will also receive a letter from the Donor Coordinator giving them general information about the recipient(s) of the organs.

Transplant recipients may write a thank you letter to the donor family. Manitoba Law requires Transplant Manitoba to be responsible for sending these letters between

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance

between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

12/19/2019 Matching Donors and Recipients | Organ Donor
<https://www.organdonor.gov/about/process/matching.html#expandcollapse> 2/6
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

32:3 Blockchain is not the magic bullet to address all organ donation woes..... (6:663 [6:1805]) - D 32: Blockchain & Health

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● Process

12 Quotations:

2:9 Successful Organ Donation Requires • Identification of potential organ..... (1:2789 [1:3051]) - D 2: Organ Donor Problems

Successful Organ Donation Requires • Identification of potential organ donor • Determination and certification of brain death • Consent to organ donation from the family • Diagnosis and management of organ donor problems • Organ retrieval and transplantation

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2.6. Organ allocation For some organs, particularly kidneys, hearts, and pediatric organs, the successful long-term outcome of the transplant depends partly on ensuring an appropriate matching between donor and recipient. A well-organized system for allocating and transporting donated organs in the most adequate way is important. In some cases, optimum allocation will require exchange of organs between transplant organizations and countries. Cooperation between countries is increasingly important

14:1 When matching organs from deceased donors to patients on the waiting..... (1:975 [2:420]) - D 14: Matching Donors and Recipients

When matching organs from deceased donors to patients on the waiting list, many of the factors taken into consideration are the same for all organs. These usually include: Blood type Body size Severity of patient's medical condition Distance between the donor's hospital and the patient's hospital The patient's waiting time Whether the patient is available (for example, whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

12/19/2019 Matching Donors and Recipients | Organ Donor
<https://www.organdonor.gov/about/process/matching.html#expandcollapse 2/6>
expand all / close all Depending on the organ, however, some factors become more important. For example, some organs can survive outside the body longer than others. So the distance between the donor's hospital and the potential recipient's hospital must be taken into consideration.

15:1 Registering as a Donor The process of donation most often begins with..... (1:616 [1:973]) - D 15: The Deceased Donation Process

Registering as a Donor The process of donation most often begins with your consent to be a donor by registering in your state. Signing up does not guarantee you will be able to donate your organs, eyes, or tissues—and registering usually takes place many years before donation becomes possible. But it is the first step to being eligible to save lives.

15:2 Medical Care of Potential Donors For someone to become a deceased don..... (1:1019 [2:354]) - D 15: The Deceased Donation Process

Medical Care of Potential Donors For someone to become a deceased donor, he or she has to die in very specific circumstances. Most often, a patient comes to a hospital because of illness or accident, such as a severe head trauma, a brain aneurysm (/about/facts- □ □

12/19/2019 The Deceased Donation Process | Organ Donor
<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse 2/6> terms/terms.html#a) or stroke.

The patient is put on artificial or mechanical support, which keeps blood with oxygen flowing to the organs. The medical team does everything possible to save the patient's life. At

15:3 Brain Death Testing Even though the medical team members do everythin..... (2:436 [2:915]) - D 15: The Deceased Donation Process

Brain Death Testing Even though the medical team members do everything they can to save the patient's life, sometimes the injuries are too severe and the patient dies.

If the patient is dead and is not responding, physicians will perform a series of tests to determine if brain death has occurred. A patient who is brain dead has no brain activity and cannot breathe on his or her own. Brain death is death and it is irreversible. Someone who is brain dead cannot recover.

15:4 The Organ Procurement Organization The hospital notifies the local Org..... (2:1063 [2:1554]) - D 15: The Deceased Donation Process

The Organ Procurement Organization The hospital notifies the local Organ Procurement Organization (OPO) (/about/facts-terms/terms.html#div_3&#o) of

every patient that has died or is nearing death. This is in keeping with federal regulations.

The hospital gives the OPO information about the deceased patient to confirm whether he or she has the potential to be a donor. If the person could be a candidate for donation, a representative from the OPO travels immediately to the hospital.

15:5 Authorizing Donation The OPO representative searches to see if the deceased..... (2:1618 [2:1986]) - D 15: The Deceased Donation Process

Authorizing Donation The OPO representative searches to see if the deceased is registered as a donor on their state registry. If so, that will serve as legal consent for donation.

If the deceased has not registered, and there was no other legal consent for donation, such as a notation on the driver's license, the OPO will ask the next of kin for authorization.

15:6 The Matching Process If the deceased person's evaluation allows donation..... (3:286 [3:844]) - D 15: The Deceased Donation Process

The Matching Process If the deceased person's evaluation allows donation, the OPO contacts the Organ Procurement and Transplantation Network (OPTN) ([/about/facts-terms/terms.html#div_3&#o](#)).

The OPTN operates the national database of all patients in the U.S. waiting for a transplant. The OPO enters information about the deceased donor into the computer system and the search begins.

The computer system generates a list of patients who match the donor (by organ).

Each available organ is offered to the transplant team of the best-matched patient.

15:7 Recovering and Transporting Organs While the search for matching recipients..... (3:1272 [4:473]) - D 15: The Deceased Donation Process

Recovering and Transporting Organs While the search for matching recipients is under way, the deceased donor's organs are maintained on artificial support. Machines keep blood containing oxygen flowing to the organs. The condition of each organ is carefully monitored by the hospital medical staff and the OPO procurement coordinator.

A transplant surgical team replaces the medical team that treated the patient before death. (The medical team trying to save the patient's life and the transplant team are never the same team.) The surgical team removes the organs and tissues from the donor's body in an operating room. First, organs are recovered, and then additional authorized tissues such as bone, cornea, and skin. All incisions are surgically closed. Organ donation does not interfere with open-casket funerals.

12/19/2019 The Deceased Donation Process | Organ Donor
<https://www.organdonor.gov/about/process/deceased-donation.html#expandcollapse> 4/6 Organs remain healthy only for a short period of time after removal from the donor, so minutes count. The OPO representative arranges the transportation of the organs to the hospitals of the intended recipients. Transportation depends on the distance involved, and can include ambulances, helicopters, and commercial airplanes.

15:8 Transplanting the Organs The transplant operation takes place after t..... (4:567 [4:958]) - D 15: The Deceased Donation Process

Transplanting the Organs The transplant operation takes place after the transport team arrives at the hospital with the new organ. The transplant recipient is typically waiting at the hospital and may already be in the operating room awaiting the arrival of the lifesaving organ.

Surgical teams work around the clock as needed to transplant the new organs into the waiting recipients.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 17 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

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A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

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<https://geoffreycann.com/someone-could-die-blockchain-in-the-highest-trust-situations/> 5/9 Privacy - Terms hospital, the surgery room / schedule at the recipient's hospital, and others. Another ledger is created and consensus gained.

Once all parties agree on a date and time for the organ transplant, the organ is removed (consensus must be reached that the correct organ has been removed – was it the left side kidney or the right side kidney?) and packed for transport. The organ is transferred from operating room, to packaging, to transportation, to another transportation, to another hospital, to another operating room. At this point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour

that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Resources

3 Quotations:

2:4 lack of facilities in government hospitals (1:1585 [1:1627]) - D 2: Organ Donor Problems

lack of facilities in government hospitals

4:11 The main aim of GREEN CORRIDOR is to save lives. It has been implemen..... (5:755 [5:1030]) - D 4: Green Corridor

The main aim of GREEN CORRIDOR is to save lives. It has been implemented for quick transport of an organ from a brain dead person to a recipient at a designated hospital. The need for a GREEN CORRIDOR arises because of the short viability of the harvested organ.

32:1 Ahead of an organ being removed from the donor, complete consensus must be reached (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients' are found. Each donor can save up to 10 people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

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point, the supply chain resembles a food cold chain (a supply chain that has to maintain product within a temperature range): the organ must be kept at a specific temperature to keep it healthy. Furthermore, time is of the essence, as every hour that an organ exists outside of a human body increases the chance of organ rejection in the recipient.

Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

● Tracking

5 Quotations:

24:6 Adopting Blockchain for storing patient's health record data and management..... (10:700 [10:1122]) - D 24: Blockchain based Organ Transplant Services

Adopting Blockchain for storing patient's health record data and management of medical records will enable patients to control access to their healthcare data. This will eliminate the need to acquiring copies of the healthcare data or sending data to another healthcare provider. Numerous companies are involved in adopting Blockchain technology such as Healthcare Data Gateways (Snow, Deery, Kirby, & Johnston, 2015).

24:7 There is a huge gap between healthcare providers and end users because..... (11:2307 [11:2490]) - D 24: Blockchain based Organ Transplant Services

There is a huge gap between healthcare providers and end users because of non-transparent information exchange which ultimately affects the entire healthcare including medical system.

24:8 Based on its practical outcomes, trust in results, integrity and almost..... (14:630 [14:1232]) - D 24: Blockchain based Organ Transplant Services

Based on its practical outcomes, trust in results, integrity and almost foolproof security in Blockchain there is an enormous increase in the use of Blockchain technology in healthcare. The importance of Organ donation cannot be ignored in healthcare system. It is a process of giving of an organ and tissue to support someone that needs transplant. Which ultimately can protect or transform the life of a person.

The process of organ donation needs to be efficient, secure, distributed, trackable and immutable that can only be achieved if Blockchain technology carefully used for the processes.

32:1 Ahead of an organ being removed from the donor, complete consensus must..... (4:1255 [5:1196]) - D 32: Blockchain & Health

Ahead of an organ being removed from the donor, complete consensus must be reached by these parties, and one of them is already deceased. A single ledger with at least six signatures, all auditable, is key to successful organ donation and the safety of a future recipient. An uncontested ledger is passed. The donor's organs are identified in a registry, and recipients are found. Each donor can save up to five people's lives with their organs. It is therefore critical that the right organ is matched with the right recipient.

A recipient for one of the organs is identified. Another series of contraindications are tested, on the recipient side (e.g., blood type, sex, weight, age, size and a myriad of other factors are considered). At the donor's hospital, another series of sign offs by the recipient, the recipient's doctor, the surgery room / schedule at the donor's !

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Once the organ reaches the hospital, the organ must be identified correctly and it must be matched to the correct recipient.

32:2 HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system..... (5:1197 [5:1959]) - D 32: Blockchain & Health

HOW TO BLOCKCHAIN THE ORGAN The potential for an error in this system to cost someone's life is high. The current process for organ transportation is highly regulated, highly paperwork-intensive. In a blockchain, each transaction would be managed by a shared ledger, the chain tracking: The organ's temperature throughout the journey using an onboard sensor to create contraindications as needed An onboard GPS to communicate the status of the organ The identity of the organ in question, and its match to the correct transportation mode Arrival and reception of the organ by the right hospital Match of the right organ to the right recipient Inclusion of the donor's medical record and recipient's medical record to create a common view of the organ