ORGAN DONOR

Dept. of General & Transplantation Surgery,
Medical University of Warsaw
Maciej Kosieradzki, MD PhD
Organ donors

- Living donors
- Deceased donors
  - Donors with neurological definition of death (brain-dead donors - BDD)
  - Donors with circulatory definition of death (non-heart beating donors - NHBD)
- Regenerative medicine
  [http://www.wakehealth.edu/WFIRM/](http://www.wakehealth.edu/WFIRM/)
- Xenografts
Living donor

- Related donors
- Non-related donors
  - Family
  - Partners
  - Friends
  - Domino donors
  - Altruistic donors

- Organ trafficking
  - eBay auction: one functional human kidney for 5.7 million $
The procedure is safe (Amsterdam Forum)
- Mortality and morbidity similar or better than age-matched general population
  - Is the control group appropriate?

Registries mandatory
- In Poland 30% LD are reported

Follow-up mandatory
- Who should be responsible for follow-up?
- Which tests should be done, how often?
- Who pays for screening?
- Compliance?
Organs transplanted from living donors

- Kidney
- Liver
- Intestine
- Lung
- Pancreas
- Bone marrow

- Age-related decline in renal function
- No increase in blood pressure
- GFR of 75-85% of normal
- Renal failure rate similar to normal population
- Donor death rate of 0.02-0.03%
- Liver donor mortality 0.2%
- Lower mortality with left lobe donation
- Morbidity of 16%, with biliary and infectious complications being most common
Deceased donors

ACTUAL DECEASED ORGAN DONORS – included NHBD - Annual Rate p.m.p. 2010
**Possible deceased organ donor**

A patient with a devastating brain injury or lesion or a patient with circulatory failure and apparently medically suitable for organ donation.

### Donation after circulatory death (DCD)

**Potential DCD donor**
- A person whose circulatory and respiratory functions have ceased and resuscitative measures are not to be attempted or continued.
- or
- A person in whom the cessation of circulatory and respiratory functions is anticipated to occur within a time frame that will enable organ recovery.

**Eligible DCD donor**
- A medically suitable person who has been declared dead based on the irreversible absence of circulatory and respiratory functions as stipulated by the law of the relevant jurisdiction, within a time frame that enables organ recovery.

**Actual DCD donor**
- A consented eligible donor:
  - In whom an operative incision was made with the intent of organ recovery for the purpose of transplantation.
  - or
  - From whom at least one organ was recovered for the purpose of transplantation.

**Utilized DCD donor**
- An actual donor from whom at least one organ was transplanted.

### Donation after brain death (DBD)

**Potential DBD donor**
- A person whose clinical condition is suspected to fulfill brain death criteria.

**Eligible DBD donor**
- A medically suitable person who has been declared dead based on neurologic criteria as stipulated by the law of the relevant jurisdiction.

**Actual DBD donor**
- A consented eligible donor:
  - In whom an operative incision was made with the intent of organ recovery for the purpose of transplantation.
  - or
  - From whom at least one organ was recovered for the purpose of transplantation.

**Utilized DBD donor**
- An actual donor from whom at least one organ was transplanted.

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*The “dead donor rule” must be respected. That is, patients may only become donors after death, and the recovery of organs must not cause a donor’s death.*
Deceased donor – consent

- Opt-in (direct consent)
  - Donor registries
  - Donor card/driver’s license
  - Living Wills
  - Mandated choice
  - Family/ legal representative consent

- Opt-out (presumed consent) (24 EU countries)
  - Registries
  - Sharing the views with family and friends
  - „Soft” presumed consent
Deceased donor

- Detailed medical and social history
- Complete physical examination
- Review of current hospital course
- Organ-specific function
- Age
- Infectious disease status
- Screen for malignancy (actual and history of)
Contraindications to donation

ABSOLUTE

- Transmissable infections
  - HIV, HTLV I, active HBV, West Nile virus, encephalitis of unknown reason, Creutzfeldt–Jakob disease, malaria, tuberculosis
- Active neoplasm
- Signs that organ will not function

RELATIVE

- Donor age
- Systemic bacterial infection
- Syphilis
- HBV infection
- HCV
- End-organ disease
Brain-dead donor

- Cerebral insults (SAH, SDH, CVA) 60%
- Severe head injuries 30%
- Primary brain tumors 2%
- Other 8%
  - Cerebral anoxia (near drowning, drug overdose, myocardial infarction with CA)
  - Homicides/suicides
  - Hypothermia
  - Metabolic disorders (DKA)
Brain dead donor

- Patient on mechanical ventilation, heart beating
- Absence of spontaneous movements and response to stimulus
- Absence of spontaneous respiration
- Absence of brain stem reflexes
- Excluded reversible etiology
>60 years old

>50 years old + 2 of the following:
  - Hypertension
  - Serum creatinine >1.5 mg/dL
  - Death from CVA

<table>
<thead>
<tr>
<th>ECD</th>
<th>SCD</th>
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<tbody>
<tr>
<td>Half-life 6-8 years</td>
<td>10-12 years</td>
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<tr>
<td>43% of WL</td>
<td></td>
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<tr>
<td>Consent?</td>
<td></td>
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<tr>
<td>18% higher chance of Tx</td>
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</table>
ECDs

- Donors with medical complexities
- Organs underutilized:
  - HCV infection
  - Other infections, unusual
  - Obesity
  - Catecholamine dependent
I phase: increase of intracranial pressure: ↑ of catecholamines, ↑ of sympathetic system activation, ↑ blood pressure, ↑ vascular resistance, ↓ CO

II phase: after stem death: ↓ loss of vascular wall tension, ↓ CVP, ↓ venous return and CO, ↓ HR

**GOALS OF DONOR TREATMENT**

- SAP > 100 mmHg
- MAP > 50 mmHg
- CVP 8 - 12 cm H$_2$O
- diuresis 1 - 1,5 ml / kg / hour
- Na <160
Non-heart beating donors

- Circulatory definition of death: not all cells die immediately

Maastricht categories:
I  dead on arrival
II  unsuccessful resuscitation
III awaited cardiac arrest
IV  CA in a brain-dead patient
Criteria of irreversible CA (Poland)

- Min. 20 minutes resuscitation
- No spontaneous pulse at any time
- 5 min observation
  - No spontaneous pulse
  - Asystole or electromechanical dissociation
  - No brain stem reflexes
    - Reaction to the light
    - Corneal reflex
    - Oculocephalic reflex
    - Pain reaction
    - Respiratory function
Maastricht category I and II

15'  90'  120'  240'

CPR

Pre-hospital phase

Beginning of perfusion

Extracorporeal oxygenation
Organs retrieved from NHBD
Figure 1. Kidney transplantations at the Hospital Clinico San Carlos, Madrid, Spain, January 1989–December 2004.

“Other transplantations” are those involving other than single adult cadaveric heart-beating donors (en bloc pediatric renal transplantations or double renal transplantations from donors ≥60 years of age) and those involving types III, IV, and V non-heart-beating donors.
Post-Tx renal function

Figura 6 Tasa de infección y rechazo en el postoperatorio inmediato del trasplante de pulmón en donantes tras la muerte cardíaca y en muerte encefálica.

Figura 7 Tasa de pacientes libres de bronquiolitis obliterante tras el trasplante de pulmón desde donantes en muerte encefálica (amarillo) y corazón parado (verde) a los 5 años del implante.
All major religions accept organ donation

- Roman Catholic Church: donation as an act of charity saves lives
- Muslims require informed consent of the donor signed in advance
- Jehovah’s Witnesses: organs must be drained of any blood
- In Jewish religion organs can be retrieved after cessation of a heartbeat

- Few are against: Shinto, Gypsies
## GLOBAL DATA

<table>
<thead>
<tr>
<th>WHO Region (N)</th>
<th>Kidney N (pmp)²</th>
<th>Liver N (pmp)²</th>
<th>Heart N (pmp)²</th>
<th>Lung N (pmp)²</th>
<th>Pancreas N(pmp)²</th>
<th>Total N(pmp)²</th>
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<tbody>
<tr>
<td>AFR (9)</td>
<td>LD: 323 (0.8)</td>
<td>LD: 5 (0.01)</td>
<td>26 (0.06)</td>
<td>8 (0.02)</td>
<td>11 (0.03)</td>
<td>550 (1.3)</td>
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<td></td>
<td>DD: 140 (0.3)</td>
<td>DD: 37 (0.09)</td>
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<td>AMR (21)</td>
<td>LD: 11036 (12.1)</td>
<td>LD: 336 (0.4)</td>
<td>2784 (3.1)</td>
<td>1913 (2.1)</td>
<td>1393 (1.5)</td>
<td>42743 (47.0)*</td>
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<td>DD: 16692 (18.4)</td>
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<td>EMR (14)</td>
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<td>LD: 192 (0.4)</td>
<td>61 (0.1)</td>
<td>10 (0.02)</td>
<td>20 (0.04)</td>
<td>6088 (12.3)</td>
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<tr>
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<td>DD: 550 (1.1)</td>
<td>DD: 223 (0.4)</td>
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<td>EUR (38)</td>
<td>LD: 5597 (7.2)</td>
<td>LD: 583 (0.75)</td>
<td>2239 (2.9)</td>
<td>1535 (2.0)</td>
<td>824 (1.05)</td>
<td>33942 (43.6)**</td>
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<td>DD: 16116 (20.7)</td>
<td>DD: 6994 (9.0)</td>
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<td>SEAR (9)</td>
<td>LD: 5496 (3.1)</td>
<td>LD: 403 (0.23)</td>
<td>13 (0.007)</td>
<td>-</td>
<td>-</td>
<td>6322 (3.6)</td>
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<td>DD: 305 (0.17)</td>
<td>DD: 105 (0.06)</td>
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<td>WPR (11)</td>
<td>LD: 5313 (3.0)</td>
<td>LD: 1760 (1.0)</td>
<td>280 (0.16)</td>
<td>183 (0.10)</td>
<td>68 (0.04)</td>
<td>14420 (8.2)***</td>
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<td>DD: 1984 (1.1)</td>
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<tr>
<td>TOTAL (102)</td>
<td>71418 (11.6)</td>
<td>21027 (3.4)</td>
<td>5403 (0.9)</td>
<td>3649 (0.6)</td>
<td>2316 (0.4)</td>
<td>104065 (17.0)****</td>
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