Economical Impact of Accepting Extended Donor Criteria Organs

How to optimize donor potential

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Pushing the envelope towards maximization of the donor pool

... Is this economically beneficial?

Definition of Extended Criteria Donor Organs

... An organ which has been declined by 5 centers in a row at moment of allocation...

... An organ which I don’t want to transplant in any of my close family members...

Definition of Extended Criteria Donor Organs

- Organs that are likely to function sub-optimal after being transplanted
- Clinical function is determined by
  - Cause of death (HBD or DCD)
  - Sub-optimal donor management
  - Co-morbidity in donor’s medical history
  - Surgical and preservation damage
- Organ specific
Definition of Extended Criteria Donor Organs

- DCD donors
  - Controlled
  - Uncollected
- Haemodynamic instable donors
- Co morbidity
  - Age related
  - Disease related
- Infected donors
  - Bacterial or Viral
- Malignancy
- Extended ischemia time
- Surgically damaged organs

What influences organ function post-TX

ECD

Transplant Side:
- Ischemia
- Preservation
- Reperfusion
- Comorbidity
- Immunology
- Infection

Transplant Outcome

Donor Side:
- Hemodynamics
- Neurohormonal disturbances
- Pre-inflamatory perturbations
- Comorbidity

Age Profile Effective Donors

Median age 2006 effective donors: 46,4 yrs (1yr – 87yr)
% associated comorbidity in HB Donors

Donor Age and Graft Outcome

Is transplantation economically beneficial to the Health Care Society?

- Loss of a graft in surviving patients has economic impact on society and the patient and their family
- Lifetime treatment costs are higher in transplant patients with functioning grafts because of greater life expectancy
- QALY gained after transplantation is standard of measure

2 Raftery J. BMJ 2001; 323:1300-1303
Is transplantation economically beneficial to the Health Care Society?

Renal transplantation

- Cost effectiveness per Life Year saved dramatically differs between Haemodialysis (HD) and Kidney Transplantation (KiTx)
  - Between 55,000 USD and 80,000 USD for HD
  - 10,000 USD for KiTx

- Health care related costs decrease for KiTx versus HD
  - Between the same range 1st yr
  - Decrease with 15-35% over the following years

- Pre-dialysis Health related quality of life declines rapidly


Is transplantation economically beneficial to the Health Care Society?

Renal transplantation

- Yearly increase of the worldwide dialysis population with 8%
  - More cardio-vascular diseases
  - Epidemic Diabetes type II
  - Aging population

- Transplantation is the preferred choice of ESRD treatment
  - 1/3 of the cost the first year of Transplantation compared to Hemodialysis
  - Cost per gained life year is 1/4 of the cost per gained life year at HD
  - Decreases further with 11% p/year compared to HD

1 Minister Vandenbroucke, 5th European Peritoneal Dialysis Conference Brussels 2002

Is transplantation economically beneficial to the Health Care Society?

Heart and Lung transplantation

- Lung Transplantation is cost-beneficial in added Life Years and QOL/Yrs gained
  - Saves the more expensive treatment
  - Life saving transplant

- Clinical and cost-effectiveness of VAD systems in bridging to heart transplantation or in long term treatment
  - Not cost-effective but clinically effective in bridge to transplant
  - Improved functional status on short term

1 Vasiailiadis et al J Heart Lung Transplant 2006; 25(9):1275-83 &
Anyanwu et al J Thorac Cardiovasc Surg; 123(3):411-8
From the moment a Transplantation will save the life of an individual and leads to Quality Adjusted Life Years...

Transplantation is cost-effective to the individual, and the society.

Cost analysis points of the Extended Criteria Donor

Pre - procurement
- Related to ICU
- Management
- Staff
- CPR techniques

Procurement and preservation
- Related to OR
- Anesthesiology
- Staff
- (Extended) preservation

Transplantation
- Related to Graft function
- Delayed Graft Function
- Re-transplantation
- Donor Related
- Complications

Problem of cost calculation in ECD

Donor centre
---$$

TX centre
+++$$

Costs in Extended Criteria Donors To increase organ Yielding through Advanced Resuscitation and Management

Savings at Transplant side
More Organs Transplanted
Cost Analysis Points in Extended Donors:

Extended Donors contrast with their Non-Beating Donors.

- **Heart Beating Donors**
  - Health Insurance
  - Health care related Costs

- **Non-Beating Donors**
  - DCD procedure or HBD procedure
  - DCD Donors: shorter management
  - HBD Donors: longer management due to impact of Brain Death

*Decision making on ICU*

- **BD is an evolution**
  - May take several hours

- **Decision:**
  - To continue full therapy until BD occurs
  - To code the patient for withdraw support...

- **ICU is expensive therapy but is necessary to make donation possible**

*Cost analysis points in Extended Criteria Donors*

- **Pre-procurement costs**
  - Donor management
  - Hemodynamic instability or advanced CPR
  - Age and/or disease related co-morbidity
  - Requesting diagnostics and screening
  - Time related ICU occupancy
  - Staff

- **Costs on ICU**
  - 1 hr of ICU approx €150 – 300
  - Advanced fluid repletion and monitoring approx €100
  - ECMO device
  - Approx €3500 / day
Cost analysis points in Extended Criteria Donors

- More investigation needed before yielding of organs is assured
- More aggressive management
- More staff and time investment
- Quick procedure
- Basic investigations
- Basic management techniques

**Without certainty of transplanting the organ? Or with higher chance of more yielding/donor?**


Cost analysis points in Extended Criteria Donors

- Aggressive donor management could increase significantly organ yielding per donor
  - Systematic Swan Ganz TD catheter
  - Aggressive fluid resuscitation
  - Early pharmacological interventions
  - Prevention and aggressive treatment of complications

1. Rosendale et al. Transplantation 2003; Vol 75: 482-487
Cost analysis points in Extended Criteria Donors
Pre-Procurement: possible interventions

- Extra-corporal support for organ donation after cardiac death effectively expands the donor pool.
  - Increased the donor pool with 33%.
  - No adverse effects on outcome.
- Could be used in Cat I and II Maastricht classification DCD donors.
  - Aggressive resuscitation of possible transplantable organs.
  - Large and costly investment with a possible negative impact.
  - Excessive engagement of teams in donor hospitals.


Cost analysis points in Extended Criteria Donors
Pre-Procurement: possible interventions

- Need for clear definitions of Extended Criteria Donors.
  - Related costs can be identified and justified.
  - Can be reimbursed.
- Need for Protocols of "Standards of Practice" in such donors.
  - Investigations related to type of Extended criteria donor.
  - Team interventions (work and economic burden of the donor hospital).
  - Standardized reimbursement for such donors.
- Needs budget planning in ICU related costs.
  - Care programs for Organ donation.
  - Cost planning for Organ donors.

Cost analysis points in Extended Criteria Donors
Surgical intervention and preservation

- Sub-optimal preservation leads to primary non-function or delayed graft function.
- Peri-operative management.
- Surgical graft damage.
Cost analysis points in Extended Criteria Donors

- Extended criteria donor organs have
  - Suffered co-morbidity impact
  - Acute impact cause of death / clinical situation

- Preservation as such impacts organ function
  - Possible stronger negative impact in ECD
  - Beneficial invasive preservation methods

Incidence of rejection related to extended Cold Ischemia in Liver Transplantation

CTS Collaborative Transplant Study Heidelberg
Cost analysis points in Extended Criteria Donors

Preservation

Every investment made to avoid DGF or PNF through advanced preservation methods will be economically beneficial because it will:

- Avoid long ICU therapy
- Avoid temporary Assist devices
- Dialysis
- LVAD – BVAD
- Contribute to longer organ survival
- Lower incidence of rejection
- Lower co-morbidity due to frequent readmissions

Is machine perfusion economically justified to use:

- Lack of evidence in large randomized trials
- Promising results showing > 10% difference in DGF in favor of Machine Preservation Methods
  - Reduces immediate post-OP costs
  - Guarantee better long term survival
- Builds in a "safety window"
  - Diagnose the impact on the organ
  - Perfusion parameters
  - Optimal controlled preservation

Impact of DGF

- Incidence of in-hospital dialysis
- Incidence of rejection
- More adjusted complications
- Longer hospital stay

Machine perfusion in ECD donors: >10% less DGF

- No dialysis
- Lower rejection
- Less adjusted complications
- Shorter hospital stay

Cost analysis points in Extended Criteria Donors

Preservation: Machine Preservation

- No immediate difference between CS or MP
- No immediate cost recovery from decreased incidence of DGF
- BUT in extended criteria donors and especially NHBD, MP could be beneficial on the long term
  - Gives an extra opportunity to evaluate ECD organs which will indirectly save costs at the TX side
  - Avoid non-function grafts or poor-functioning grafts with impact on Hospital stay
  - Complications

Cost Savings
- €4 000 000 directly saved
- Another 25% costs saved the first year of transplant because:
  - Lower post-operative costs
  - Less readmissions

   File sent to the Central Health Care Department F. Van Gelder, J. Pirenne

Surgical Damaged Kidneys in ECD
Surgical Damaged Kidneys in ECD

Cost analysis points in Extended Criteria Donors:
- Surgical intervention and preservation
  - Optimize maximally preservation in ECD
    - Tools to evaluate, preserve and guarantee quality
    - Avoid Intox (G1)
    - Extended preservation methods such as MP
  - Peri-operative management
    - Organ donor management has to be as optimal as pre
    - Peri-operative biopsy before perfusion impact may be useful
  - Surgical graft damage
    - Intolerable especially in ECD
    - Well trained organ extraction teams
    - Certification and standardized technical training
Cost analysis points in Extended Criteria Donors

- If Graft survival and patient survival is similar
  - First year of transplant:
    - $71,026 US$ in normal donors versus $76,962 US$ in ECD
  - Re-transplantation:
    - $91,296 US$ in normal donors versus $136,596 US$ in ECD

- Higher post-serum creatinine


Take Home Message

- **Analysis of different cost points in ECD is needed**
  - Different points in the process with related costs
  - Interventions to maximize organ yielding versus the cost
  - Proper reimbursement of such interventions

- **Determine Standards of Practise for ECD donors**
  - Protocols
  - Resuscitation
  - Preservation
  - Evaluation tools of Organ Quality (scores, MP, …)

- **Experienced donor and surgical teams**
  - Ensure maximal quality and safety
  - Better outcomes related to ECD

Take Home Message (2)

- **Relate cost investment @ Donor side**
  - versus
  - **Cost savings @ Transplant side**

- **Determine pathways for Cost calculation concerning the Type of Donor**
  - DCD versus HBDD
  - ECD versus SCD

- **ECD donors need optimal management and preservation**
  - to optimize possible negative impact of co-morbidity
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