United States Donation After Circulatory Death (DCD) Experience

Presented by:
Howard M. Nathan
President & CEO
OUR TODAY, THEIR TOMORROW:
Rewriting the stories...
What I Will Discuss Today

**Background on DCDs in the United States**
- Historical Perspective & Overview
- Statistics, Data and Analysis
- Regional Variations in Recovery and Transplantation of DCDs

**Gift of Life Donor Program Philadelphia DCD Experience**
- Implementation into OPO & Hospital Practice
- Clinical Practice
- Data

**Future of DCD Practices. Estimation of DCD Pool and Extraordinary DCD Cases**
<table>
<thead>
<tr>
<th>Type</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brain Dead</strong></td>
<td>- Death declared based upon neuro criteria</td>
</tr>
<tr>
<td></td>
<td>- Heart beat is intact</td>
</tr>
<tr>
<td><strong>DCD</strong></td>
<td>- Donation After Cardiac (Circulatory) Death</td>
</tr>
<tr>
<td></td>
<td>- Non-heart beating donation</td>
</tr>
<tr>
<td><strong>Living</strong></td>
<td>- Related or unrelated</td>
</tr>
<tr>
<td></td>
<td>- Directed or non-directed</td>
</tr>
</tbody>
</table>
Donation After Cardiac Death (DCD)

**Definition:**
A procedure whereby organs are surgically recovered following pronouncement of death based on “irreversible cessation of circulatory and respiratory functions.”

**Controlled**
Death & organ recovery can be predictably controlled following the withdrawal of life support.

**Uncontrolled**
Cardiac arrest is unplanned. Timing of other aspects of organ recovery are not controlled.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Dead on arrival</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Uncontrolled)</em></td>
<td></td>
</tr>
<tr>
<td>II.</td>
<td>Unsuccessful resuscitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Uncontrolled)</em></td>
<td></td>
</tr>
<tr>
<td>III.</td>
<td>Awaiting cardiac arrest</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Controlled)</em></td>
<td></td>
</tr>
<tr>
<td>IV.</td>
<td>Cardiac arrest while brain dead</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Uncontrolled)</em></td>
<td></td>
</tr>
<tr>
<td>V.</td>
<td>Cardiac arrest in a hospital inpatient</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Uncontrolled)</em></td>
<td></td>
</tr>
</tbody>
</table>

Source: Transplant Proceedings, Vol 27, No. 5
1951 - Hume, Kidney transplant

1963 - Starzl, Liver transplant

1967 - Barnard, Heart transplant

1968 - Harvard Committee (Brain Death Criteria Established)

1970’s – Acceptance of Brain Death Criteria

1990’s – Re-evaluation of DCD
IOM Recommendation: Non-Heartbeating Donor Organ Donation (Donation after Cardiac Death)

“All organ procurement organizations (OPOs) should explore the option of non-heartbeating organ transplantation, in cooperation with local hospitals, health care professionals and communities.”
“In January 2007, the Joint Commission implemented its first accreditation standard for donation after cardiac death.”

OPTN/UNOS, has developed rules for donation after cardiac death... “As of July 1, 2007, OPTN/UNOS has required all 257 transplant hospitals and 58 organ-procurement organizations in the United States to comply with its new rules.”

“In 1997, 2000, and 2005, the Institute of Medicine reviewed and voiced support for donation after cardiac death.”

“In 2005, a conference on donation after cardiac death concluded that it is “an ethically acceptable practice of end-of-life care, capable of increasing the number of deceased donor organs available for transplantation.” Bernard et al. AJT 2006; 6(2):281-291

Incidence of Deceleration of Care

“The number of deaths that occur in the ICU after the withdrawal of life support is increasing, with one recent survey finding that 90% of patients who die in ICU’s now do so after a decision to limit therapy.”
It is the consensus opinion of the Ethics Committee of the Society of Critical Care Medicine that death determination for both intensive care unit patients and potential nonheartbeating donors should utilize the same criteria within a single institution.
DCD is medically acceptable and ethical provided informed consent is obtained from patient or designee.

Informed consent is ethical cornerstone - special training required for those obtaining consent due to complexity.

Death must be certified using standardized, objective, and auditable criteria and must follow state law.

It is ethically reasonable for DCD to occur with pediatric patients.

If, in the process of delivering high quality end-of-life care, organ donation is possible then the professional should support that outcome.
IOM report developed by a group of transplant professionals to address feasibility of uncontrolled Donation After Cardiac Death Determination (DCDD)

Findings promote the need for educational efforts in order to gain acceptance of uncontrolled DCDD

22,000 potential uncontrolled DCD donors estimated in U.S. annually— the largest number of unused organ donors
U.S. Growth In Donation after Cardiac Death 1995 – 2015

In 2015, DCD donors provided 2,876 life-saving organ transplants.

Source: Based on OPTN data through December 31, 2015. Data subject to change due to future data submission or correction.
### U.S. OPO Experience – Organ Donors / DCDs
#### 1995 – 2015

<table>
<thead>
<tr>
<th>Year Donor Recovered</th>
<th>Total Donors (includes DCDs)</th>
<th>Total DCDs</th>
<th>DCD Percent of Total</th>
<th>Number of OPOs with at least one DCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>5,363</td>
<td>64</td>
<td>1.2%</td>
<td>22</td>
</tr>
<tr>
<td>1996</td>
<td>5,418</td>
<td>70</td>
<td>1.3%</td>
<td>21</td>
</tr>
<tr>
<td>1997</td>
<td>5,479</td>
<td>78</td>
<td>1.4%</td>
<td>19</td>
</tr>
<tr>
<td>1998</td>
<td>5,793</td>
<td>75</td>
<td>1.4%</td>
<td>16</td>
</tr>
<tr>
<td>1999</td>
<td>5,824</td>
<td>87</td>
<td>1.7%</td>
<td>18</td>
</tr>
<tr>
<td>2000</td>
<td>5,985</td>
<td>118</td>
<td>1.9%</td>
<td>22</td>
</tr>
<tr>
<td>2001</td>
<td>6,080</td>
<td>167</td>
<td>2.7%</td>
<td>29</td>
</tr>
<tr>
<td>2002</td>
<td>6,190</td>
<td>190</td>
<td>3.1%</td>
<td>31</td>
</tr>
<tr>
<td>2003</td>
<td>6,457</td>
<td>270</td>
<td>4.1%</td>
<td>32</td>
</tr>
<tr>
<td>2004</td>
<td>7,150</td>
<td>393</td>
<td>5.4%</td>
<td>43</td>
</tr>
<tr>
<td>2005</td>
<td>7,593</td>
<td>564</td>
<td>7.4%</td>
<td>49</td>
</tr>
<tr>
<td>2006</td>
<td>8,017</td>
<td>642</td>
<td>8.0%</td>
<td>54</td>
</tr>
<tr>
<td>2007</td>
<td>8,085</td>
<td>791</td>
<td>9.8%</td>
<td>57</td>
</tr>
<tr>
<td>2008</td>
<td>7,989</td>
<td>849</td>
<td>10.6%</td>
<td>55</td>
</tr>
<tr>
<td>2009</td>
<td>8,022</td>
<td>920</td>
<td>11.5%</td>
<td>55</td>
</tr>
<tr>
<td>2010</td>
<td>7,943</td>
<td>941</td>
<td>11.8%</td>
<td>55</td>
</tr>
<tr>
<td>2011</td>
<td>8,126</td>
<td>1,057</td>
<td>12.9%</td>
<td>57</td>
</tr>
<tr>
<td>2012</td>
<td>8,143</td>
<td>1,107</td>
<td>13.6%</td>
<td>56</td>
</tr>
<tr>
<td>2013</td>
<td>8,268</td>
<td>1,206</td>
<td>14.6%</td>
<td>57</td>
</tr>
<tr>
<td>2014</td>
<td>8,596</td>
<td>1,292</td>
<td>15.0%</td>
<td>57</td>
</tr>
<tr>
<td>2015</td>
<td>9,080</td>
<td>1,494</td>
<td>16.5%</td>
<td>57</td>
</tr>
</tbody>
</table>

*Source: Based on OPTN data through December 31, 2015.*

Total Deceased Organ Donors = 109,659

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BD (n=97,943)</th>
<th>DCDs (n=11,716)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>7,586</td>
<td>1,494 (9,080)</td>
</tr>
<tr>
<td>2014</td>
<td>7,304</td>
<td>1,292 (8,596)</td>
</tr>
<tr>
<td>2013</td>
<td>7,062</td>
<td>1,206 (8,268)</td>
</tr>
<tr>
<td>2012</td>
<td>7,036</td>
<td>1,107 (8,143)</td>
</tr>
<tr>
<td>2011</td>
<td>7,069</td>
<td>1,057 (8,126)</td>
</tr>
<tr>
<td>2010</td>
<td>7,002</td>
<td>941 (7,943)</td>
</tr>
<tr>
<td>2009</td>
<td>7,102</td>
<td>920 (8,022)</td>
</tr>
<tr>
<td>2008</td>
<td>7,140</td>
<td>849 (7,989)</td>
</tr>
<tr>
<td>2007</td>
<td>7,294</td>
<td>791 (8,085)</td>
</tr>
<tr>
<td>2006</td>
<td>7,375</td>
<td>642 (8,017)</td>
</tr>
<tr>
<td>2005</td>
<td>7,029</td>
<td>564 (7,593)</td>
</tr>
<tr>
<td>2004</td>
<td>6,757</td>
<td>393 (6,457)</td>
</tr>
<tr>
<td>2003</td>
<td>6,187</td>
<td>270 (6,190)</td>
</tr>
<tr>
<td>2002</td>
<td>6,000</td>
<td>190</td>
</tr>
</tbody>
</table>

Source: Based on OPTN data through December 31, 2015.
DCD Recoveries by OPO

Number Recovered:
- None Recovered
- At Least 1 Recovered
National DCD Experience – Number of DCD Donors Recovered/Transplants
January 1, 2004 – December 31, 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of DCD Donors</th>
<th>TOTAL</th>
<th>KIDNEY</th>
<th>LIVER</th>
<th>PANCREAS</th>
<th>LUNGS</th>
<th>HEART</th>
<th>INTESTINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>393</td>
<td>790</td>
<td>566</td>
<td>184</td>
<td>29</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>564</td>
<td>1,112</td>
<td>795</td>
<td>272</td>
<td>32</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>642</td>
<td>1,362</td>
<td>1,014</td>
<td>289</td>
<td>35</td>
<td>24</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>791</td>
<td>1,521</td>
<td>1,171</td>
<td>306</td>
<td>25</td>
<td>16</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>849</td>
<td>1,651</td>
<td>1,308</td>
<td>277</td>
<td>32</td>
<td>34</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>920</td>
<td>1,769</td>
<td>1,385</td>
<td>289</td>
<td>39</td>
<td>56</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>941</td>
<td>1,798</td>
<td>1,468</td>
<td>269</td>
<td>36</td>
<td>24</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>1,057</td>
<td>2,103</td>
<td>1,766</td>
<td>270</td>
<td>33</td>
<td>34</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>1,107</td>
<td>2,010</td>
<td>1,699</td>
<td>263</td>
<td>16</td>
<td>32</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2013</td>
<td>1,206</td>
<td>2,273</td>
<td>1,889</td>
<td>309</td>
<td>19</td>
<td>56</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>1,292</td>
<td>2,551</td>
<td>2,087</td>
<td>364</td>
<td>26</td>
<td>74</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>1,494</td>
<td>2,876</td>
<td>2,332</td>
<td>405</td>
<td>25</td>
<td>114</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,256</strong></td>
<td><strong>21,816</strong></td>
<td><strong>17,480</strong></td>
<td><strong>3,497</strong></td>
<td><strong>487</strong></td>
<td><strong>5</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

Source: Based on OPTN data through December 31, 2015. Data subject to change due to future data submission or correction.
## 14 OPOs Recovering > 35 DCDs: 2015

<table>
<thead>
<tr>
<th>OPO</th>
<th>Deceased Donors</th>
<th>DCD Donors</th>
<th>% DCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>New England Organ Bank (CT, MA, ME, NH, RI, VT)</td>
<td>282</td>
<td>85</td>
<td>30%</td>
</tr>
<tr>
<td>Gift of Life Donor Program (DE, NJ, PA)</td>
<td>483</td>
<td>83</td>
<td>17%</td>
</tr>
<tr>
<td>Gift of Life Michigan (MI)</td>
<td>285</td>
<td>74</td>
<td>26%</td>
</tr>
<tr>
<td>Gift of Hope Organ &amp; Tissue Donor Network (IL &amp; IN)</td>
<td>379</td>
<td>73</td>
<td>19%</td>
</tr>
<tr>
<td>OneLegacy (CA)</td>
<td>460</td>
<td>60</td>
<td>13%</td>
</tr>
<tr>
<td>LifeCenter Northwest (AK, ID, MT, WA)</td>
<td>200</td>
<td>50</td>
<td>25%</td>
</tr>
<tr>
<td>Midwest Transplant Network (KS &amp; MO)</td>
<td>200</td>
<td>47</td>
<td>24%</td>
</tr>
<tr>
<td>LifeGift Organ Donation Center (TX)</td>
<td>283</td>
<td>46</td>
<td>16%</td>
</tr>
<tr>
<td>LifeShare Transplant Donor Services of Oklahoma (OK)</td>
<td>174</td>
<td>42</td>
<td>24%</td>
</tr>
<tr>
<td>Donor Network of Arizona (AZ)</td>
<td>166</td>
<td>39</td>
<td>23%</td>
</tr>
<tr>
<td>LifeSource Upper Midwest (MN, ND, SD &amp; WI)</td>
<td>154</td>
<td>39</td>
<td>25%</td>
</tr>
<tr>
<td>Carolina Donor Services (NC &amp; VA)</td>
<td>159</td>
<td>36</td>
<td>23%</td>
</tr>
<tr>
<td>Pacific Northwest Transplant Bank (OR, ID &amp; WA)</td>
<td>120</td>
<td>36</td>
<td>30%</td>
</tr>
<tr>
<td>Center for Organ Recovery and Education (NY, PA &amp; WV)</td>
<td>207</td>
<td>36</td>
<td>17%</td>
</tr>
</tbody>
</table>

14 of 58 OPOs (24%) recovered 746 of the 1,494 DCDs (50%)
<table>
<thead>
<tr>
<th>All Organ Procurement Organizations</th>
<th>Total Donors*</th>
<th>DCD Donors</th>
<th>DCD % of Total</th>
<th>DCD Organs Transplanted</th>
<th>Organs Transplanted Per Donor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9,080</td>
<td>1,494</td>
<td>16%</td>
<td>2,876</td>
<td>1.93</td>
</tr>
</tbody>
</table>

*Total Donors based upon deceased donors only.

Source: Based on OPTN data through December 31, 2015. Data subject to change due to future data submission or correction.
Life-Saving Organ Transplants from U.S. DCD Donors


(Total DCD Donors = 1,494)

Source: Based on OPTN data through December 31, 2015. Data subject to change due to future data submission or correction.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidneys</td>
<td>2,332</td>
</tr>
<tr>
<td>Livers</td>
<td>405</td>
</tr>
<tr>
<td>Pancreas</td>
<td>25</td>
</tr>
<tr>
<td>Lungs</td>
<td>114</td>
</tr>
<tr>
<td>Hearts</td>
<td>0</td>
</tr>
<tr>
<td>Intestine</td>
<td>0</td>
</tr>
</tbody>
</table>
DCD Kidney Transplants in the United States
1995 – 2015
(n=19,208)

Source: Based on OPTN data through December 31, 2015.

Source: Based on OPTN data through December 31, 2015.
3-Year U.S. Kaplan Meier Kidney Patient Survival
DCD/Non-ECD vs. SCD 1/1/2010 – 12/31/2012

Source: Based on OPTN Data as of March 11, 2016
3-Year U.S. Kaplan Meier Kidney Graft Survival
DCD/Non-ECD vs. SCD 1/1/2010 – 12/31/2012

Source: Based on OPTN Data as of March 11, 2016
3-Year U.S. Kaplan Meier Kidney Graft Survival
DCD/ECD vs. DBD/ECD 1/1/2010 – 12/31/2012

Source: Based on OPTN Data as of March 11, 2016
DCD Liver Transplants in the United States
1995 – 2015
(n=3,878)

Source: Based on OPTN data through December 31, 2015.
DCD Liver Utilization in the U.S. 2008 – 2015

Source: Based on OPTN data through December 31, 2015.
3 Year U.S. Kaplan Meier Liver Patient Survival
DCD/Non-ECD vs. SCD 1/1/2010 – 12/31/2012

Source: Based on OPTN Data as of March 11, 2016
3 Year U.S. Kaplan Meier Liver Graft Survival
DCD/Non-ECD vs. SCD  1/1/2010 – 12/31/2012

Source: Based on OPTN Data as of March 11, 2016
DCD Lung Transplants in the United States 2004 – 2015

(n=477)

Source: Based on OPTN data through December 31, 2015.
DCD Lung Utilization in the U.S. 2008 - 2015

Source: Based on OPTN data through December 31, 2015.
Gift of Life Donor Program  
Philadelphia, Pennsylvania USA

- Non-Profit OPO/Tissue Recovery/Eye Bank
- Established in 1974
- Largest OPO in the United States
- Federally designated OPO (by Medicare) for eastern PA, Southern NJ & Delaware
  - 129 Acute Care Hospitals
  - 15 Transplant Centers, 42 Programs
  - 11 Million Population
- 483 organ donors in 2015, resulting in 1,291 transplants; highest volume in the U.S. – 44 donors/MM; 1,202 bone recoveries; 2,265 cornea recoveries and 2,546 tissue recoveries
- Over 40,000 organs for transplantation and over 550,000 tissue allografts
- Accredited by: Association of Organ Procurement Organizations (AOPO); American Assoc. of Tissue Banks (AATB) & Eye Bank Assoc. of America (EBAA); UNOS/OPTN member OPO
A Mother’s Perseverance
Changed Gift of Life’s Practice

“For my family, donation wasn’t about the process, it was about the outcome.”
~ Susan McVey-Dillon
Donor Mother
June, 1995

Like all end-of-life care, the DCD process is committed to the care of the patient and meeting the needs of the family.
Sue McVey Dillon,
Mother of Gift of Life’s First DCD Donor
Speaking at the U.S. National Learning Congress in 2005
Gift of Life Donor Program Results
Organ Donor Experience – BD vs. DCD Donors
1994 – 2015

Total Donors = 7,976

Source: Based on Gift of Life Donor Program data through December 31, 2015.
Gift of Life: Potential Organ Donor PATHWAYS
ROUTINE REFERRAL All Vent-Dependent
Patients With A Non-Recoverable Neurological Injury

**Neuro Exam**

*Donation after Brain Death*
- Exam consistent with brain death
- Support family through grave prognosis
- Death determined by neuro criteria
- Ensure family understands death has occurred
- Approach family about donation options (GLDP And Care Team)
- Patient transferred to OR
- Surgical recovery

*Donation after Cardiac Death*
- Exam **Not** consistent with brain death
- Care Team / Family discuss grave prognosis & withdrawal of life sustaining therapies
- Ensure family understands grave prognosis
- Approach family about donation options (GLDP And Care Team)
- Support family through informed decision making process
- Support patient during organ evaluation & allocation
- Patient transferred to OR / Withdrawal of Life Support
- Death determined by cardio-pulmonary criteria
- Surgical recovery
Critical Care Nurse dedicated the April 2006 issue entirely to donation and transplantation.

Maximizing Organ Donation Opportunities Through Donation After Cardiac Death

John Edwards, RN, RRT, CPTC
Patii Malvania, RN, CEN, CPTC
Virginia Robertson
Gweneth George
Richard Hess, MFS, CPTC
Howard Nathan, CPTC
Anthony D'Alessandro, MD

Organ transplantation is established therapy for many patients with a variety of end-stage diseases. The survival benefits are remarkable, as are the improvements in quality of life. Unfortunately, the supply of donor organs remains insufficient to meet the need. Recently, through participation in the breakthrough collaboratives of the Health and Human Resources Administration, organ procurement organizations (OPOs) have become engaged in systems change through application of the principles of continuous improvement. So-called best practices are being shared by OPOs. This sharing, in turn, has created a level of synergy among OPO professionals and hospitals alike that is having a positive impact on the donor supply (Table 1).

John Edwards is the clinical administrator for Gift of Life Donor Program in Philadelphia, Pa., overseeing all clinical aspects of organ and tissue recovery, and a faculty member of the Gift of Life Institute, Philadelphia, providing training and mentoring for healthcare organizations nationally.

Patii Malvania oversees the clinical education program for the Gift of Life Donor Program in Philadelphia and is a faculty member of the Gift of Life Institute, specializing in consent and clinical communication.

Virginia Robertson is the associate director of the Gift of Life Institute in Philadelphia. Formerly, she was the director of hospital services for the Gift of Life Donor Program.

Gweneth George is the director of hospital services for the Gift of Life Donor Program in Philadelphia. She directs a team of nearly 20 hospital development staff accountable for donation performance in 150 acute care hospitals.

Authors
## Gift of Life Donor Program
### Patient Referrals & Donation Outcomes
#### 2002 – 2015

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Organ Donor Referrals</th>
<th>Not Brain Dead Referrals</th>
<th>Organ Donors</th>
<th>DCD Donors (% of total donors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1,507</td>
<td>375</td>
<td>354</td>
<td>36 (10%)</td>
</tr>
<tr>
<td>2003</td>
<td>1,540</td>
<td>440</td>
<td>344</td>
<td>51 (15%)</td>
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<tr>
<td>2004</td>
<td>1,734</td>
<td>508</td>
<td>387</td>
<td>47 (12%)</td>
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<tr>
<td>2005</td>
<td>2,235</td>
<td>637</td>
<td>382</td>
<td>57 (15%)</td>
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<tr>
<td>2006</td>
<td>2,454</td>
<td>723</td>
<td>401</td>
<td>67 (17%)</td>
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<tr>
<td>2007</td>
<td>2,941</td>
<td>743</td>
<td>389</td>
<td>47 (12%)</td>
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<tr>
<td>2008</td>
<td>3,476</td>
<td>924</td>
<td>428</td>
<td>70 (16%)</td>
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<tr>
<td>2009</td>
<td>3,815</td>
<td>1,009</td>
<td>439</td>
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<tr>
<td>2010</td>
<td>3,768</td>
<td>1,388</td>
<td>392</td>
<td>85 (22%)</td>
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<tr>
<td>2011</td>
<td>4,151</td>
<td>1,763</td>
<td>441</td>
<td>84 (19%)</td>
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<tr>
<td>2012</td>
<td>4,326</td>
<td>2,037</td>
<td>417</td>
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<tr>
<td>2013</td>
<td>4,453</td>
<td>2,208</td>
<td>447</td>
<td>61 (14%)</td>
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<tr>
<td>2014</td>
<td>4,690</td>
<td>2,509</td>
<td>447</td>
<td>66 (15%)</td>
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<tr>
<td>2015</td>
<td>4,802</td>
<td>2,543</td>
<td>483</td>
<td>83 (17%)</td>
</tr>
<tr>
<td>Totals</td>
<td>45,892</td>
<td>17,807</td>
<td>5,751</td>
<td>884 (15%)</td>
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</table>
## Gift of Life Donor Program
### DCD Experience: Organs Transplanted 1995 – 2015

<table>
<thead>
<tr>
<th></th>
<th>‘95</th>
<th>‘96</th>
<th>‘97</th>
<th>‘98</th>
<th>‘99</th>
<th>‘00</th>
<th>‘01</th>
<th>‘02</th>
<th>‘03</th>
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<th>‘10</th>
<th>‘11</th>
<th>‘12</th>
<th>‘13</th>
<th>‘14</th>
<th>‘15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DCD Donors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>1,016</strong></td>
</tr>
<tr>
<td>Kidneys</td>
<td>4</td>
<td>17</td>
<td>21</td>
<td>37</td>
<td>43</td>
<td>42</td>
<td>50</td>
<td>65</td>
<td>77</td>
<td>72</td>
<td>88</td>
<td>122</td>
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<td>99</td>
<td>102</td>
<td>126</td>
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<tr>
<td>Livers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>13</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>22</td>
<td>16</td>
<td>11</td>
<td>14</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>12</td>
<td>10</td>
<td><strong>204</strong></td>
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<tr>
<td>Pancreas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>0</td>
<td>3</td>
<td><strong>18</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Organs Transplanted**: 1,836

*Source: Based on Gift of Life Donor Program data through December 31, 2015.*
Gift of Life Donor Program  
Hospital Profile DCD Donors  
1995 – 2015

1,016 DCD Cases in 95 Hospitals

- **15** Transplant Centers  
  (564 cases – 56%)

- **15** Trauma Centers**  
  (205 cases – 20%)

- **65** Community Hospitals  
  (247 cases – 24%)

**Trauma centers only—does not include transplant centers that are also trauma centers.

Source: Based on Gift of Life Donor Program data through December 31, 2015.
Gift of Life Donor Program

DCD Characteristics
1995 – 2015

Controlled vs. Uncontrolled

Source: Based on Gift of Life Donor Program data through December 31, 2015.
Gift of Life Donor Program

Uncontrolled DCD Organs Recovered/Transplanted
1996 – 2015

Total Uncontrolled DCD Cases = 173

KIDNEY
- RECOVERED: 338
- TRANSPLANTED: 224 (66%)

LIVER
- RECOVERED: 40
- TRANSPLANTED: 12 (30%)

PANCREAS
- RECOVERED: 3
- TRANSPLANTED: 2 (67%)

Source: Based on Gift of Life Donor Program data through December 31, 2015.
Gift of Life Donor Program

Uncontrolled DCD Demographics
1996 – 2015

Total Uncontrolled DCD Cases = 173

Age -  6 months - 76 years; Mean = 32 years

WIT** - 2 to 214 Minutes; Mean = 48 minutes

Gender -  Male – 111 (64%)  Female – 62 (36%)

Cause of Death -  

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>89 (51%)</td>
</tr>
<tr>
<td>Anoxia</td>
<td>55 (32%)</td>
</tr>
<tr>
<td>CVA</td>
<td>25 (15%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2%)</td>
</tr>
</tbody>
</table>

Source: Based on Gift of Life Donor Program data through December 31, 2015.

** WIT is defined by GLDP as time removed from the ventilator to aortic cross clamp.
What Do We Evaluate to Determine DCD Potential?

- Organ Function
- Secretions
- Work of Breathing
- Length of Time Patient On Vent
- Care/Comfort
- Patient’s Physical Attributes
- Patient’s Stated Wish to Donate
  - Donor Designation, Conversation w/family, etc.
- Family’s Commitment to Process
Patient Assessment
For Determination of DCD Suitability

Key Aspects:
– Physician approval (mandatory)
– Determine level of sedation
– Note type of airway (ETT vs. Tracheostomy)
– Note facial trauma, neck / tongue size, secretion production

With appropriate care giving team members present, remove pt. from ventilator
Observe and Measure the following:
– Respiratory Rate
– Tidal Volume
– Minute Ventilation
– Negative Inspiratory Force (NIF)
– Changes in Hemodynamics & Oxygen Saturation
– Length of Time off Ventilator

Respiratory Assessment may be performed at different times during the evaluation process based on the patient’s condition and family and care giving team’s decision-making process

Respiratory Assessment should NOT be performed in certain situations, examples are:
– Profound hemodynamic instability
– Severe pulmonary injury (i.e. ARDS)
– Patient actively receiving paralytics
– High level spinal cord injury
– Significant dependence on maximal ventilatory support
– Complete dependence on some type of mechanical device (i.e. ECMO, RVAD, LVAD, BiVAD,)

The Critical Care Team independently determines comfort care administration and airway removal. The OPO/Transplant team cannot participate in these decisions.
Respiratory Assessment
For Determination of DCD Suitability

Key Aspects:
- Physician approval (mandatory)
- Determine level of sedation

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- Complete dependence on some type of mechanical device (i.e. ECMO, RVAD, LVAD, BiVAD,)

Additional Factors in DCD Suitability
The Critical Care Team independently determines comfort care administration and airway removal.
The OPO/Transplant team cannot participate in these decisions.
Clinical Considerations: Family Discussion

- Decision to Withdraw Support
- Decision to Donate Organs
Family Communication: What Families Want, and Need to Know

Empowered Decision Making

Information

Emotional & Spiritual Support
Clinical Considerations: Family Discussion

Considerations for Informed Consent

- Heparin administration
- Organs may be unsuitable for transplant
- Family presence in the OR
- Patient may not arrest within required timeframe for donation

Note: A separate consent is required for any invasive procedure
...determination of death will be made and the time of death will be recorded in the medical record.

...donation of organs and/or tissues will occur after artificial support has been discontinued and determination of death has been made.

...actual time until death occurs is variable, and if extended, may preclude organ donation.

...care and comfort measures will be guided by the hospital’s care giving team and that heparin will be administered prior to the discontinuation of artificial support for the purpose of supporting organ recovery.
Change of Location: ICU vs. OR

- Emphasis on change of location, **not** change of withdrawal process
- Timing of recovery following withdrawal and determination of death
- Importance of ischemic time as it relates to organ viability and recipient survival
DCD Clinical Considerations: Family in Attendance at the Withdrawal

- Determine who and how many people will be attending the withdrawal
- Review prepping and draping
- Prepare room for family to go to following the death
- Communicate the process
- Describe each person’s role(s)… If the pronouncing physician is different from the attending, make sure you introduce both physicians to the family
- Determine how long the family is going to remain at the hospital following the death
- Determine if the family has any special requirements
- Review instrumentation with staff/recovery team, then cover with sterile drapes and back away from OR stretcher
- Post a sign in the OR that a family is present!
DCD Clinical Considerations

Pronouncement of Death

Attending Physician pronounces death via cardiopulmonary criteria

Transplant team **NOT** permitted in OR until death has been pronounced

IOM guidelines are followed
(5 minute waiting period)

If patient does not die in timeframe that allows for successful organ recovery, the patient is returned to pre-determined area and comfort care / family support will be continued.
DCD Clinical Considerations: *Organ Allocation*

- DCD organs should be allocated per UNOS or local governing body guidelines.

- All organs, including thoracic organs *(if the patient is an appropriate candidate)* should be attempted to be allocated.

- Efforts should be made to expedite testing such as tissue typing to reduce cold ischemic time.
DCD Clinical Considerations:
*If the Patient Does Not Die…Next Steps*

- Re-admission to ICU or med-surg
- Attending physician
- Continued care and comfort
- DNR
- Support system for family
- According to pre-determined plan
Are Medical Professionals Hastening the Death of the Patient With DCD?

• Patients considered for DCD have suffered an irreversible, catastrophic brain injury or other end-stage condition.

• Family members – in consultation with the patient’s physician – decide whether life support should be withdrawn.

• The decision to withdraw life support and the decision to donate organs are independent of one another.
The Supply of Controlled DCDs in the United States
Halpern, SD, Hasz, R. et al
JAMA, December 15, 2010—Vol 304, No. 23

- Retrospective review of death records in 50 large hospitals in Gift of Life region (trauma centers and/or > 20 ICU beds)
- Patients removed from vent and died within 120 minutes
- Medically suitable for donation of at least one organ
- Estimated 3,200 to 4,700 potential DCDs (controlled) in the U.S.
In hopes of ultimately narrowing the gap between the supply and demand of organs for transplantation, a pilot project in New York City is looking to a group of individuals who currently aren't eligible to donate in the United States—those who die of a cardiac cause at home.

“As the Institute of Medicine suggested, even using restrictive criteria of people whose kidneys would be adequate, there might be 20,000 people easily available in America were we to develop a system.”

NYC program may help thousands waiting for organ transplants

Organ preservation units follow ambulances to cardiac arrest calls
Pittsburgh Condition T Rapid Recovery Protocol

Standard Emergency Department (ED) care
Efforts to resuscitate patient fail: patient dies
Family members notified of death

Per routine, local Organ Procurement Organization (OPO) notified
ED notified deceased is organ donor
Family members notified of donor

Condition T called
Condition T team arrives and initiates donor management

Successful organ transplant

Normal High-Quality ED Process
Summary of DCDs in the U.S.

- 16% of organ donors in 2015
- 57 of 58 OPOs recovered DCDs (2015)
- Extensive literature on DCD protocols
- Most hospitals have DCD policies
- Transplant outcomes comparable to DBDs
- Uncontrolled DCDs/Rapid Recovery in some OPOs
- DCDs could increase donor pool significantly and reduce deaths on the wait list
CASE STUDIES
Patient Presentation - 2007

28 y/o Male police officer hit by bus with traumatic brain injury, pulmonary contusions

Patient was intubated in ER and started on pressors, hespan

Initial head CT revealed SAH, SDH with midline shift

4 hours after admission to ICU, patient was referred to Gift of Life Donor Program (GLDP)
Clinical Presentation

Patient unstable upon GLDP Transplant Coordinator (TC) arrival on ICU

Patient on maximum pressor support with BP in low 50’s; continuing to hemorrhage from head wounds

Patient’s wife decided to maintain current course of treatment short of “heroic measures”

GLDP TC partnered with care team for early family approach prior to pronouncement of death to preserve the family’s opportunity for donation
Uncontrolled DCD Timeline

0 Hours
- Admission to ER
- Patient Unstable

4 Hours
- Patient Resuscitated
- Patient Transferred to ICU
- Timely Referral to GLDP

6 Hours
- Team Huddle
- Consent
- Collaborative Donation Discussion

8 Hours
- Patient Arrested
- CPR Initiated

10 Hours
- CPR Continued

12 Hours
- Crossed Clamped
- Kidney's Enroute to Pump
- Two lives saved

Mobilization of Resources
- Preserving The Opportunity
Kidney Recovery Data

Warm Ischemic Time
144 minutes (time from w/d to cross-clamp)

Biopsy
- Right Kidney: 51 glomeruli with 5% sclerosed
- Left Kidney: 41 glomeruli with 2% sclerosed

Pulsatile Preservation Results
Right Kidney:
- Flow of 120 cc/min and resistance of 0.24

Left Kidney:
- Flow of 125 cc/min and resistance of 0.23
Outcomes

**Right Kidney:**
Transplanted into a 37 y/o male with five children.

He had been waiting for a life-saving transplant for three years.

**Left Kidney:**
Transplanted into a 41 y/o male with one child.

He had been waiting for over three years for a transplant.
Summary

Kidneys can be successfully recovered and transplanted from uncontrolled DCD donors.

Families need to be informed of the necessity of chest compressions to preserve the opportunity for donation.

Organ procurement organizations (OPOs) should consider developing protocols to address uncontrolled DCD in their donation service area to increase the number of organs available for transplantation.
Case Study: DCD Organ Donor AICU

- Patient JM: 58 year-old Caucasian Female
- Past Medical Hx: ALS, on Bipap, patient reaches out to Gift of Life and signs consent on 1/4; Regional hospital ICU attending physician and staff made aware by GOL team ahead of time
- 2/12: Patient experiences respiratory distress and is admitted to ED and then ICU and place on vent in order be to be a Donor after Cardiac Death (DCD), as per patient’s wishes
- Attending ICU physician and several nurses from the ICU support patient and take patient to OR for DCD donation process
- 2/13: Patient donates both of her kidneys after cardiac death, one of which goes to the patient’s cousin
A mother’s plea to fulfill both of her daughter’s end-of-life wishes:

The patient was donor designated and had also made the request that should she die, she wanted her service dog of many years by her side during the process.
Recovery

• The family and service dog were dressed appropriately for the OR.

• Family and the service dog were escorted to patient’s side for extubation.

• Death was determined 15 minutes later
Upon asystole, the dog who had been lying calm throughout the process, stood up and put his head under her hand.

Both kidneys were transplanted with 27 minutes of warm ischemic time. The liver was placed for research.
OUR TODAY, THEIR TOMORROW:
Rewriting the stories...