From the Combined Registries of the Australian and New Zealand Liver Transplant Centres

DATA TO 31-12-2017
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Editors: S.V. Lynch, G.A. Balderson

STATISTICAL METHODS

Kaplan-Meier survival curves have been produced using IBM SPSS® for Windows™ Release 23.0.

ACKNOWLEDGMENT

The Cancer Registry is maintained at Transplantation Services, Royal Prince Alfred Hospital, Sydney. Report prepared by Pamela Dilworth, Marie Mulhearn and Dr Deborah Verran.

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We are pleased to present the 29th Report of the Australia and New Zealand Liver Transplant Registry (ANZLTR). This report contains data to the 31st December 2017 and analyses the cumulative data since the establishment of the first liver transplantation unit in Australia or New Zealand in 1985.

The Australia and New Zealand Liver Transplant Registry (ANZLTR) is a collaborative effort of the liver transplantation centres in Australia (Adelaide, Brisbane, Melbourne, Perth, Sydney) and New Zealand (Auckland). The Registry is supervised by the Management Committee which is involved in the ongoing supervision of the development of the Registry. The members of the Management Committee are listed on the front page.

Donor data have been supplied by the Australia and New Zealand Organ Donor Registry and we thank them for their collaboration.

The Editors would also like to thank the staff of all the liver transplant units who contribute their data by direct entry into the ANZLTR database. A full list of the units and their contact information can be found in Appendix I. In particular we are grateful to the efforts of Pamela Dilworth, Program Manager and Marie Mulhearn for their continuing contribution to the maintenance of the Cancer Registry which is based at the Royal Prince Alfred Hospital, Sydney and who, together with Dr Deborah Verran, prepare the Cancer Report.

We are grateful to the Australian Government, through the Australian Organ and Tissue Authority, for their ongoing financial support. We would also like to thank Astellas Pharma Australia Pty Ltd for additional financial support.

Comments are always welcome and should be forwarded to the Coordinating Centre at the contact information listed on the front page as should requests for further copies of this Report. The report is now also available on the ANZLTR public web site www3.anzltr.org from where the report can be downloaded. Slides are available on request from the Coordinating Centre.

Stephen Lynch
Glenda Balderson
Summary

Between January 1985 and 31st December 2017, 5890 orthotopic liver transplants (OLT) were performed in Australia and New Zealand on 5450* patients, 4515 adult patients [83%] and 935 children (<16 years) [17%]. (*Three patients had their primary transplant overseas, one adult and two children). The median age of all recipients was 49.2 years. The ages ranged from 24 days to 73.0 years. There is a significant difference in gender distribution between children (M=48%) and adults (M=66%).

Three hundred and thirteen new patients were transplanted in 2017 compared with 336 in 2016.

The trend to increasing age of adult recipients in recent years continued and the overall adult median age is now 52.2 years. The median age of new adult recipients in 2015 -17 was 56.9 years.

In 2017, there was a decrease in the number of transplants with 36 less performed [337 vs 373]. Split grafts continue to make a significant contribution to the total number of paediatric transplants performed providing 28 of 48 [58%] of deceased donor grafts in 2017 and 325 of 978 [30.5%] overall. In children, other reduced size grafts have been used in 425 [40%] cases including 85 living donor grafts. One child has been treated with liver cell implantation. Of adult patients, 338 have received reduced size grafts - 321 split liver grafts (including one as auxiliary graft), 32 other reduced size grafts (one as auxiliary graft) and 16 living donor grafts. Four domino transplants of a whole liver have been performed.

Overall, chronic viral hepatitis (CVH) is the most common primary indication for liver transplantation. In children biliary atresia (BA) is the most common primary disease. In adults chronic hepatitis C [CVH : HCV] is the primary disease in 18.2% of recipients and chronic hepatitis B [CVH : HBV] in 4.6%. Full details of specific diagnoses categories by age group are listed in the Appendices for – Metabolic disorders (Appendix II), Other diseases (Appendix III) and Fulminant Hepatic Failure (Appendix IV).

The number of patients transplanted with non-alcoholic fatty liver disease [NAFLD/NASH] as the primary diagnosis was 24 [9%] of new patients transplanted in 2017 bringing the total to 180. The proportion of adult patients transplanted with a primary diagnosis of chronic viral Hepatitis B, C or B/C/D fell in 2017 compared with the previous eras but the number of patients with a primary diagnosis of hepatocellular carcinoma [HCC] increased and accounted for 23% in 2017. The majority of these patients have a secondary diagnosis of CVH: HCV or HBV. When patients with either primary or secondary diagnosis of Hepatitis B,C or both are included, the overall incidence of CVH in new adult patients in 2017 was 37%.

Overall one year patient survival of all patients is 90% at one year, 86% at 5 years and 75% at 10 years. Children have a significantly better survival rate than adults with an actuarial survival of 73% at 30 years post-transplant.

Whilst older children had superior early survival than infants and babies, long term survival is similar. Older adult recipients had poorer longer term outcomes.

Patient survival in later cohorts show continued improvement in outcome for the first 10 years compared with earlier cohorts. This is seen in both children and adults. One year patient survival in 2015-17 cohort was 95% for all patients [98% for children, 95% for adults].

In both children and adults, there are worse early outcomes in patients receiving a deceased donor reduced size graft as their primary graft compared with split liver graft or whole liver grafts. Split liver grafts and whole livers have similar early outcomes in both children and adults.
Summary

21. Smaller children and babies weighing < 8 kg at the time of transplant had inferior early survival compared to heavier children but similar long term results.

22. Adult patients transplanted for biliary atresia or hepatitis virus co-infections had the best longer term survival while those whose primary disease was primary biliary cirrhosis or primary sclerosing cholangitis or Hepatitis C have significantly lower long term survival rates.

23. In children, patient survival was similar for all disease groups though lower in patients whose primary disease was malignancy. There were no differences in survival between adults and children transplanted for fulminant hepatic failure [acute and sub-acute] with overall five year survival of 77%.

24. Recent cohorts of adult patients with a primary diagnosis of hepatitis B continue to show a significantly improved survival. Adult patients with hepatitis C as primary disease show some improvement in survival in more recent cohorts. Patients transplanted for malignancy continue to have a poor outcome but some improvement in longer term outcome is seen in patients transplanted since 2000.

25-26. Overall graft survival was 86% at one year and 78% at five years with significantly better graft survival longer term in children. Graft survival was significantly worse in second grafts in both children and adults. Third grafts in adults have better outcomes than in children.

27. Overall split liver grafts have similar graft survival to whole liver grafts. Reduced grafts have lower graft survival in the early post-transplant years in both children and adults.

28. Graft survival has increased significantly over time for all deceased donor grafts.

29-30. Vascular complications and rejection were the commonest indications for retransplantation. Fifteen percent of retransplants were due to poor early graft function. Re-transplantation for recurrent disease was most prevalent in adults [10% PSC, PBC, AIH and 9% HBV, HCV].

31-34. Sepsis is the most frequent cause of death in both adults and children. Full details of miscellaneous and other graft failure deaths are listed in Appendix V. Twenty-eight percent of all deaths occurred within six months of transplant. Deaths from early graft failure were due to poor or no early graft function. By one year malignancy and graft failure from recurrent disease or chronic rejection cause most deaths. Deaths due to de novo malignancy and chronic rejection are increasing with longer survival times.

35. There was an increase in the number of cadaveric donors in 2017 to 304 and fewer liver transplant grafts with 332 grafts transplanted from deceased donors. The number of livers split to produce two transplantable grafts was 28 in 2017. Eleven liver grafts donated after cardiac death were transplanted. The number of people on the waiting list at 31 December 2017 was lower than the number on the waiting list at 31 December 2016.

36. Donor age has increased significantly in recent years. Long term graft survival trends lower in several older donor age groups.

37. One hundred and five patients [85 children, 20 adults] have now received a living donor graft with five performed in 2017. In 98 patients the living donor graft was a primary graft, in six as a second and one as a third graft. The median age of the donors was 33.8 years with a range of 18.3 to 54.5 years. Four adult grafts were domino whole liver graft.
38. Waiting list activity for 2017 showed fewer patients listed for transplantation and an increase with 167 remaining on the waiting list at 31 December 2017. Patient delistings due to death, becoming too ill or tumour [HCC] progression accounted for 5% of all delistings. Three hundred and thirty-seven patients were transplanted [58%]. Thirty-six patients were listed as urgent in 2017 [17 with initial listing as Category 1 and 19 Category 2]. Fifteen [88%] of Category 1 and 19 [100%] of Category 2 patients had a positive outcome.

39-40. Median waiting times varied across the blood groups. Blood group A & O patients had similar waiting times to transplant but O patients was longest overall.

41. Cancer in liver transplant recipients are analysed from two perspectives. Firstly, those who had a liver cancer diagnosis at the time of transplantation (as primary, secondary or incidental) and secondly those who developed a cancer post transplantation (de novo skin and de novo non - skin cancer). Overall 1256 patients (23%) had a liver cancer at the time of transplantation with HCC being the most common (90%). Five hundred and eight patients (9%) were transplanted for primary liver cancer, 751 patients (14%) had liver cancer as a secondary or incidental diagnosis, of which 167 (23%) were undiagnosed prior to transplantation. Three of 1256 patients had both primary and secondary liver cancers and 3 had multiple secondary or incidental liver cancers.

Post transplant 165 (12%) of pretransplant cancers recurred and 150 (11% of those with cancer at transplantation) died as a result of recurrence.

42-43. Actuarial patient survival was 52% at 20 years in patients with primary liver cancer. Patients with a diagnosis of HCC or hepatoblastoma had the best survival rate [58% and 61%]. Those with cholangiocarcioma had significantly poorer survival.

44-47. In patients with liver cancer as a secondary diagnosis, 20 year patient survival was 40%. Eighty-three [12% of patients] died from recurrence of their cancer.

Overall patients with a diagnosis of pretransplant malignancy had worse survival than patients with benign diseases.

Incidence of liver cancer at time of transplantation continues to increase, climbing from 304 to 951 over the last decade.

47-53. Four hundred and seventy-one de novo non-skin types of cancer developed in 439 (8%) of patients. Thirty-two patients developed more than one de novo non-skin cancer.

Adult recipient cancer is being more commonly diagnosed from 10 years post transplantation.

The three most common categories of de novo non-skin cancer were cancers of the alimentary tract 165 (38%), lymphoma 114 (4%) and genitourinary 67 (15%).

Incidence of de novo non-skin malignancy is greatest in those with underlying hepatitis C, primary sclerosing cholangitis and alcoholic cirrhosis (p<0.0001).

54-55. Eight hundred and forty-four (16%) developed a first skin cancer, with a peak of 1-3 years after transplantation, with 400 going on to develop multiple types of skin cancer. Forty-eight patients developed 49 melanomas.
Section 1

Demographic Data
Summary Statistics by Age and Gender

### ALL PATIENTS TRANSPLANTED

<table>
<thead>
<tr>
<th>Category</th>
<th>Children [&lt;16y]</th>
<th>Adults</th>
<th>Total</th>
</tr>
</thead>
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<tr>
<td><strong>Patients</strong></td>
<td>935</td>
<td>4515</td>
<td>5450</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
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<tr>
<td>Mean ± SD</td>
<td>4.5 ± 4.5y</td>
<td>49.8 ± 11.7y</td>
<td>42.0 ± 20.2y</td>
</tr>
<tr>
<td>Median</td>
<td>2.4y</td>
<td>52.2y</td>
<td>49.2y</td>
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<tr>
<td>Range</td>
<td>24d - 15.9y</td>
<td>16.0 - 73.1y</td>
<td>24d - 73.0y</td>
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<tr>
<td><strong>Gender</strong></td>
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<td></td>
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<tr>
<td>Female</td>
<td>482 (52%)</td>
<td>1524 (34%)</td>
<td>2006 (37%)</td>
</tr>
<tr>
<td>Male</td>
<td>453 (48%)</td>
<td>2991 (66%)</td>
<td>3444 (63%)</td>
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<tr>
<td><strong>Surviving</strong></td>
<td>767 (82%)</td>
<td>3161 (70%)</td>
<td>3928 (72%)</td>
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</table>
SECTION 1: DEMOGRAPHIC DATA

Number of New Patients Transplanted by Year

Cumulative Number of New Patients Transplanted

Age Group
- Children (n=933)
- Adult (n=4514)
Number of Recipients by Age at Primary Transplant
N=5447

Median =49.2y
Range 24d - 73.0y

Age at Primary Transplant by Era

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<td>&lt; 1y</td>
<td>226</td>
<td>296</td>
<td>267</td>
<td>144</td>
<td>807</td>
<td>1,107</td>
<td>1,763</td>
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<tr>
<td>1 - 2y</td>
<td>43.9y</td>
<td>50.2y</td>
<td>52.2y</td>
<td>54.3y</td>
<td>56.9y</td>
<td>2.4y</td>
<td>2.9y</td>
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<td>3 - 9y</td>
<td>45.9y</td>
<td>48.1y</td>
<td>50.2y</td>
<td>52.2y</td>
<td>54.3y</td>
<td>2.4y</td>
<td>2.9y</td>
</tr>
<tr>
<td>10 - 15y</td>
<td>2.5y</td>
<td>3.5y</td>
<td>2.5y</td>
<td>2.2y</td>
<td>2.2y</td>
<td>1.9y</td>
<td>2.4y</td>
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<tr>
<td>16 - 39y</td>
<td>1,700</td>
<td>1,800</td>
<td>1,763</td>
<td>1,107</td>
<td>807</td>
<td>267</td>
<td>296</td>
</tr>
<tr>
<td>40 - 49y</td>
<td>620</td>
<td>1,763</td>
<td>1,107</td>
<td>807</td>
<td>267</td>
<td>296</td>
<td>1,700</td>
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<tr>
<td>50 - 59y</td>
<td>2,260</td>
<td>3,173</td>
<td>2,673</td>
<td>1,763</td>
<td>1,107</td>
<td>807</td>
<td>267</td>
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<tr>
<td>60 - 64y</td>
<td>2,173</td>
<td>3,173</td>
<td>2,673</td>
<td>1,763</td>
<td>1,107</td>
<td>807</td>
<td>267</td>
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<td>&gt;=65y</td>
<td>2,173</td>
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<td>2,673</td>
<td>1,763</td>
<td>1,107</td>
<td>807</td>
<td>267</td>
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SECTION 1 : DEMOGRAPHIC DATA
Number of Transplants by Year

Cumulative Number of Transplants
Type of Graft by Year

**Children (N = 1063)**

- Liver cells: 1
- Split: 325 (30.5%)
- Split - LRD: 85 (8.0%)
- Reduced: 340 (32.1%)
- Whole: 312 (29.4%)

**Adults (N = 4827)**

- Split: 321 (6.6%)
- Split - LRD: 16 (0.3%)
- Reduced: 32 (0.7%)
- Whole: 4458 (92.4%)

* 4 domino liver
Section 2
Primary Diagnosis
Primary Diseases of All Recipients

SECTION 2 : PRIMARY DIAGNOSIS

10. Diagnosis Group

- BA - Biliary atresia
- MET - Metabolic diseases*
- ALD - Alcoholic cirrhosis
- CC - Cryptogenic cirrhosis
- PBC - Primary biliary cirrhosis
- PSC - Primary sclerosing cholangitis
- MAL - Malignancy
- FHF - Fulminant hepatic failure*
- NAFLD - Non-alcoholic fatty liver disease
- OTH - Other diseases*
- CAH : AI - Chronic active hepatitis [autoimmune]
- CVH : HBV - Chronic viral hepatitis B
- CVH : HCV - Chronic viral hepatitis C
- CVH : B/C/D - Chronic viral hepatitis B / C / D

* See Appendices for details
Primary Diseases of Adult Recipients
N = 4514

Primary Diseases of Children
N = 933

Diagnosis Group
- BA - Biliary atresia
- MET - Metabolic diseases
- ALD - Alcoholic cirrhosis
- CC - Cryptogenic cirrhosis
- PBC - Primary biliary cirrhosis
- PSC - Primary sclerosing cholangitis
- MAL - Malignancy
- FHF - Fulminant hepatic failure
- NAFLD - Non-alcoholic fatty liver disease
- OTH - Other diseases
- CAH:AI - Chronic active hepatitis [autoimmune]
- CVH : HBV - Chronic viral hepatitis B
- CVH : HCV - Chronic viral hepatitis C
- CVH : B/C/D - Chronic viral hepatitis B / C / D

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Adult Primary Diagnosis by Era

SECTION 2 : PRIMARY DIAGNOSIS

1985 - 89  
(n=130)  
76%  
2%  
7%  
3%

1990 - 94  
(n=411)  
74%  
6%  
8%  
10%

1995 - 99  
(n=580)  
55%  
19%  
13%  
3%

2000 - 04  
(n=748)  
42%  
25%  
15%  
8%  
1%

2005 - 09  
(n=810)  
37%  
28%  
12%  
5%  
2%

2010 - 14  
(n=1031)  
34%  
28%  
13%  
6%  
2%  
3%

2015 - 2017  
(n=804)  
35%  
17%  
14%  
9%  
1%  
4%

Adult Diagnosis

- Blue: Other diseases
- Yellow: Hep B
- Green: ALD
- Red: Hep B/C/D
- Beige: HCC
- Orange: NAFLD/NASH
- Purple: Hep C

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DATA TO 31/12/2017  
SECTION 2 : PRIMARY DIAGNOSIS
### Adult Primary Diagnosis by Year

#### SECTION 2: PRIMARY DIAGNOSIS

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<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Count</th>
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<td>Hep B/C/D</td>
<td>68</td>
</tr>
<tr>
<td>Hep B</td>
<td>57</td>
</tr>
<tr>
<td>Hep C</td>
<td>66</td>
</tr>
<tr>
<td>HCC</td>
<td>53</td>
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<tr>
<td>ALD</td>
<td>51</td>
</tr>
<tr>
<td>NAFLD/NASH</td>
<td>53</td>
</tr>
<tr>
<td>Other diseases</td>
<td>61</td>
</tr>
</tbody>
</table>

#### Data to 31/12/2017

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**Primary Diagnosis**
- **Hep B/C/D**: Red
- **Hep B**: Yellow
- **Hep C**: Purple
- **HCC**: Light Green
- **ALD**: Medium Green
- **NAFLD/NASH**: Dark Green
- **Other diseases**: Blue

**Year of Transplant**

- 1985:
  - Hep B/C/D: 1
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1986:
  - Hep B/C/D: 2
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1987:
  - Hep B/C/D: 3
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1988:
  - Hep B/C/D: 4
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1989:
  - Hep B/C/D: 5
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1990:
  - Hep B/C/D: 6
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1991:
  - Hep B/C/D: 7
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1992:
  - Hep B/C/D: 8
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1993:
  - Hep B/C/D: 9
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1994:
  - Hep B/C/D: 10
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1995:
  - Hep B/C/D: 11
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1996:
  - Hep B/C/D: 12
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1997:
  - Hep B/C/D: 13
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1998:
  - Hep B/C/D: 14
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 1999:
  - Hep B/C/D: 15
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2000:
  - Hep B/C/D: 16
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2001:
  - Hep B/C/D: 17
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2002:
  - Hep B/C/D: 18
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2003:
  - Hep B/C/D: 19
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2004:
  - Hep B/C/D: 20
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2005:
  - Hep B/C/D: 21
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2006:
  - Hep B/C/D: 22
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2007:
  - Hep B/C/D: 23
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2008:
  - Hep B/C/D: 24
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2009:
  - Hep B/C/D: 25
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2010:
  - Hep B/C/D: 26
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2011:
  - Hep B/C/D: 27
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2012:
  - Hep B/C/D: 28
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2013:
  - Hep B/C/D: 29
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2014:
  - Hep B/C/D: 30
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2015:
  - Hep B/C/D: 31
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2016:
  - Hep B/C/D: 32
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0

- 2017:
  - Hep B/C/D: 33
  - Hep B: 0
  - Hep C: 0
  - HCC: 0
  - ALD: 0
  - NAFLD/NASH: 0
  - Other diseases: 0
Chronic Viral Hepatitis as Primary or Secondary Diagnosis in Adult Patients

Primary Diagnosis

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>n</th>
<th>Hepatitis C</th>
<th>Hepatitis B</th>
<th>Hepatitis B,C</th>
<th>HCC</th>
<th>NAFLD</th>
<th>ALD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis C</td>
<td>990</td>
<td>7</td>
<td></td>
<td></td>
<td>319</td>
<td>13</td>
<td>273</td>
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<tr>
<td>Hepatitis B</td>
<td>249</td>
<td>2</td>
<td></td>
<td></td>
<td>105</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>BD/BC/BCD</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>HCC + cirrhosis</td>
<td>496</td>
<td>269</td>
<td>119</td>
<td>11</td>
<td>22</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>ALD</td>
<td>575</td>
<td>32</td>
<td>3</td>
<td>69</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAFLD</td>
<td>180</td>
<td>1</td>
<td>2</td>
<td>44</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1969</td>
<td>18</td>
<td>8</td>
<td>65</td>
<td>7</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4514</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Secondary / Tertiary diagnosis

Type of Chronic Viral Hepatitis in Adult Patients by Era

Hepatitis Diagnosis

Chronic viral hepatitis
- Blue: Hepatitis B
- Green: Hepatitis C
- Yellow: Mixed B/C/D
- Purple: Hepatitis Negative
Section 3
Patient Survival
Patient Survival Post Transplant

Patient Survival (%) vs Time Post-Transplant (years)

**SECTION 3: PATIENT SURVIVAL**

**Patient Survival Post Transplant**

- Adult (n=4514)
- Children (n=933)

**Age group**

- Children (n=933) Median 8.5y (0-32.8y)
- Adult (n=4514) Median 6.6y (0-31.4y)

**No. at risk**: 
- 1y: 4626
- 3y: 3823
- 5y: 3223
- 10y: 2026
- 15y: 1182
- 20y: 579
- 25y: 214
- 30y: 11

**Actuarial Survival (%)**

- 1y: 90%
- 3y: 86%
- 5y: 83%
- 10y: 75%
- 15y: 66%
- 20y: 56%
- 25y: 50%
- 30y: 47%

**Median**

- Adult: 6.6y (0-31.4y)
- Children: 8.5y (0-32.8y)

**Range**

- Adult: 0-31.4y
- Children: 0-32.8y
SECTION 3: PATIENT SURVIVAL

### Children (N = 933)

<table>
<thead>
<tr>
<th>Age Strata</th>
<th>1y</th>
<th>3y</th>
<th>5y</th>
<th>10y</th>
<th>15y</th>
<th>20y</th>
<th>25y</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1y (n=226)</td>
<td>88%</td>
<td>86%</td>
<td>85%</td>
<td>84%</td>
<td>82%</td>
<td>80%</td>
<td>74%</td>
</tr>
<tr>
<td>1 - 2y (n=296)</td>
<td>88%</td>
<td>84%</td>
<td>83%</td>
<td>80%</td>
<td>78%</td>
<td>74%</td>
<td>70%</td>
</tr>
<tr>
<td>3 -9y (n=267)</td>
<td>92%</td>
<td>91%</td>
<td>89%</td>
<td>86%</td>
<td>86%</td>
<td>84%</td>
<td>81%</td>
</tr>
<tr>
<td>10 - 15y (n=144)</td>
<td>93%</td>
<td>92%</td>
<td>91%</td>
<td>87%</td>
<td>85%</td>
<td>78%</td>
<td>71%</td>
</tr>
</tbody>
</table>

### Adults (N = 4514)

<table>
<thead>
<tr>
<th>Age Strata</th>
<th>1y</th>
<th>3y</th>
<th>5y</th>
<th>10y</th>
<th>15y</th>
<th>20y</th>
<th>25y</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-39y (n=807)</td>
<td>90%</td>
<td>87%</td>
<td>85%</td>
<td>78%</td>
<td>70%</td>
<td>61%</td>
<td>55%</td>
</tr>
<tr>
<td>40-49y (n=1107)</td>
<td>91%</td>
<td>86%</td>
<td>82%</td>
<td>73%</td>
<td>65%</td>
<td>54%</td>
<td>45%</td>
</tr>
<tr>
<td>50-59y (n=1763)</td>
<td>91%</td>
<td>85%</td>
<td>82%</td>
<td>72%</td>
<td>60%</td>
<td>44%</td>
<td>36%</td>
</tr>
<tr>
<td>60-64y (n=620)</td>
<td>90%</td>
<td>85%</td>
<td>80%</td>
<td>68%</td>
<td>54%</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>&gt;=65y (n=217)</td>
<td>88%</td>
<td>84%</td>
<td>76%</td>
<td>60%</td>
<td>39%</td>
<td>31%</td>
<td></td>
</tr>
</tbody>
</table>
All Patient Survival by Year of Transplant

Era
- 1985-89 (n=205)
- 1990-94 (n=552)
- 1995-99 (n=697)
- 2000-04 (n=860)
- 2005-09 (n=962)
- 2010-14 (n=1228)
- 2015-17 (n=943)

Patient Survival (%) vs. Time Post-Transplant (years)

- 1985-89: 93%, 86%, 77%
- 1990-94: 86%, 79%, 71%
- 1995-99: 79%, 77%, 71%
- 2000-04: 77%, 60%, 52%
- 2005-09: 52%, 47%, 41%
- 2010-14: 53%, 51%, 45%
- 2015-17: 45%, 36%, 33%

p < 0.001

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SECTION 3: PATIENT SURVIVAL
SECTION 3: PATIENT SURVIVAL

**Children (N = 933)**

<table>
<thead>
<tr>
<th>Era</th>
<th>1985-89 (n=75)</th>
<th>1990-94 (n=141)</th>
<th>1995-99 (n=117)</th>
<th>2000-04 (n=112)</th>
<th>2005-09 (n=152)</th>
<th>2010-14 (n=197)</th>
<th>2015-17 (n=139)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Survival</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>98%</td>
<td>93%</td>
<td>93%</td>
<td>91%</td>
<td>86%</td>
<td>83%</td>
<td>86%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>94%</td>
<td>92%</td>
<td>88%</td>
<td>84%</td>
<td>81%</td>
<td>78%</td>
<td>71%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>93%</td>
<td>92%</td>
<td>86%</td>
<td>83%</td>
<td>78%</td>
<td>77%</td>
<td>69%</td>
</tr>
<tr>
<td>11-15 years</td>
<td>91%</td>
<td>88%</td>
<td>86%</td>
<td>85%</td>
<td>75%</td>
<td>75%</td>
<td>56%</td>
</tr>
<tr>
<td>16+ years</td>
<td>88%</td>
<td>84%</td>
<td>83%</td>
<td>83%</td>
<td>75%</td>
<td>69%</td>
<td>56%</td>
</tr>
</tbody>
</table>

**Adults (N = 4514)**

<table>
<thead>
<tr>
<th>Era</th>
<th>1985-89 (n=130)</th>
<th>1990-94 (n=411)</th>
<th>1995-99 (n=580)</th>
<th>2000-04 (n=748)</th>
<th>2005-09 (n=810)</th>
<th>2010-14 (n=1031)</th>
<th>2015-17 (n=804)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Survival</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>91%</td>
<td>85%</td>
<td>83%</td>
<td>83%</td>
<td>75%</td>
<td>63%</td>
<td>49%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>93%</td>
<td>85%</td>
<td>78%</td>
<td>75%</td>
<td>74%</td>
<td>60%</td>
<td>44%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>87%</td>
<td>83%</td>
<td>78%</td>
<td>75%</td>
<td>74%</td>
<td>60%</td>
<td>44%</td>
</tr>
<tr>
<td>11-15 years</td>
<td>83%</td>
<td>75%</td>
<td>69%</td>
<td>64%</td>
<td>63%</td>
<td>55%</td>
<td>37%</td>
</tr>
<tr>
<td>16+ years</td>
<td>70%</td>
<td>59%</td>
<td>49%</td>
<td>49%</td>
<td>42%</td>
<td>35%</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td>59%</td>
<td>49%</td>
<td>49%</td>
<td>42%</td>
<td>35%</td>
<td>29%</td>
<td>25%</td>
</tr>
</tbody>
</table>
Patient Survival by Type of Primary Graft
[deceased donors]

**Children (N = 853)**

- Reduced (n=295):
  - 1 year: 95%
  - 2 years: 91%
  - 3 years: 89%
  - 5 years: 87%
  - 7 years: 87%

- Split (n=287):
  - 1 year: 92%
  - 2 years: 89%
  - 3 years: 84%
  - 5 years: 84%
  - 7 years: 79%

- Whole (n=271):
  - 1 year: 84%
  - 2 years: 79%
  - 3 years: 74%
  - 5 years: 72%
  - 7 years: 75%

*P < 0.001*

**Adults (N = 4495)**

- Reduced (n=30):
  - 1 year: 90%
  - 2 years: 89%
  - 3 years: 82%
  - 5 years: 75%
  - 7 years: 66%

- Split (n=311):
  - 1 year: 90%
  - 2 years: 82%
  - 3 years: 75%
  - 5 years: 66%
  - 7 years: 66%

- Whole (4154):
  - 1 year: 66%
  - 2 years: 66%
  - 3 years: 62%
  - 5 years: 50%
  - 7 years: 43%

*P = NS*
**Patient Survival by Weight - Children**

**SECTION 3: PATIENT SURVIVAL**

**Weight Group**
- > 8 kg (n=714)
- 5-8 kg (n=210)
- < 5 kg (n=9)

**Patient Survival (%)**

| Time Post-Transplant (years) | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
|-----------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| > 8 kg (n=714)              | 92%| 84%| 80%| 85%| 83%| 79%| 74%| 74%| 73%| 73%| 78%| 78%| 77%| 77%| 78%| 78%| 78%| 74%| 74%| 74%| 73%| 73%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%|
| 5-8 kg (n=210)              | 88%| 78%| 78%| 78%| 77%| 78%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%| 74%|
| < 5 kg (n=9)                | 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%| 78%|

**P = NS**

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SECTION 3: PATIENT SURVIVAL
(1) Adults [excluding FHF] (N = 1400)

Diagnosis Group | n = | 5y | 10y | 15y | 20y | 25y
--- | --- | --- | --- | --- | --- | ---
Biliary atresia | 43 | 85% | 82% | 73% | 73% | 73%
Alcoholic cirrhosis | 575 | 86% | 73% | 59% | 40% | 32%
Metabolic diseases | 193 | 83% | 75% | 66% | 56% | 50%
CAH: AI | 162 | 83% | 74% | 59% | 51% | 44%
Cryptogenic cirrhosis | 191 | 82% | 69% | 57% | 48% | 40%
Other | 236 | 84% | 74% | 69% | 56% | 49%

(2) Adults [excluding FHF] (N = 2710)

Diagnosis Group | n = | 5y | 10y | 15y | 20y | 25y
--- | --- | --- | --- | --- | --- | ---
CVH : B,C,D | 55 | 93% | 90% | 90% | 90% | 90%
NAFLD | 180 | 86% | 70% | 61% | 42% | 42%
CVH : Hep B | 249 | 82% | 78% | 66% | 57% | 54%
CVH : Hep C | 990 | 80% | 69% | 57% | 42% | 42%
PBC | 246 | 86% | 73% | 67% | 58% | 46%
PSC | 468 | 84% | 76% | 64% | 48% | 40%
Malignancy | 522 | 76% | 68% | 67% | 58% | 58%

p = 0.03

p = 0.003
(3) Paediatric recipients [excluding FHF] (N = 834)

<table>
<thead>
<tr>
<th>Diagnosis Group</th>
<th>n</th>
<th>5y</th>
<th>10y</th>
<th>15y</th>
<th>20y</th>
<th>25y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biliary atresia</td>
<td>501</td>
<td>87%</td>
<td>84%</td>
<td>83%</td>
<td>79%</td>
<td>76%</td>
</tr>
<tr>
<td>Autoimmune hepatitis</td>
<td>10</td>
<td>100%</td>
<td>100%</td>
<td>80%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Cryptogenic cirrhosis</td>
<td>21</td>
<td>88%</td>
<td>81%</td>
<td>81%</td>
<td>65%</td>
<td>65%</td>
</tr>
<tr>
<td>Malignancy</td>
<td>37</td>
<td>80%</td>
<td>68%</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>Metabolic diseases</td>
<td>136</td>
<td>89%</td>
<td>87%</td>
<td>86%</td>
<td>81%</td>
<td>71%</td>
</tr>
<tr>
<td>Other</td>
<td>121</td>
<td>91%</td>
<td>89%</td>
<td>87%</td>
<td>87%</td>
<td>82%</td>
</tr>
<tr>
<td>PSC</td>
<td>8</td>
<td>88%</td>
<td>88%</td>
<td>88%</td>
<td>88%</td>
<td></td>
</tr>
</tbody>
</table>

(4) Fulminant hepatic failure (N = 503)

Age group
- Adult (n=404)
- Child (n=99)
- All Patients (n=503)
**SECTION 3: PATIENT SURVIVAL**

**Patient Survival by Primary Disease**

### Adults CVH: Hepatitis B (N = 249)

#### Era
- 1985-89 (n=9)
- 1990-94 (n=26)
- 1995-99 (n=54)
- 2000-04 (n=58)
- 2005-09 (n=38)
- 2010-14 (n=35)
- 2015-17 (n=29)

![Graph showing patient survival by era for Hepatitis B](image)

**P = 0.013**

### Adults CVH: Hepatitis C (N = 990)

#### Era
- 1985-89 (n=9)
- 1990-94 (n=26)
- 1995-99 (n=54)
- 2000-04 (n=58)
- 2005-09 (n=38)
- 2010-14 (n=35)
- 2015-17 (n=29)

![Graph showing patient survival by era for Hepatitis C](image)

**P = 0.013**

### Malignancy Adults and Children (N= 559)

#### Adults (n = 522)
- 1985-89 (n=12)
- 1990-94 (n=13)
- 1995-99 (n=21)
- 2000-04 (n=61)
- 2005-09 (n=109)
- 2010-14 (n=163)
- 2015-17 (n=180)

#### Children (n= 37)

![Graph showing patient survival by era for Malignancy](image)

**P < 0.001**
Graft Survival All Grafts

**Graft Survival (%)**

<table>
<thead>
<tr>
<th>Time Post-Transplant (years)</th>
<th>No. at risk</th>
<th>Actuarial Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1y</td>
<td>4780</td>
<td>86%</td>
</tr>
<tr>
<td>3y</td>
<td>3901</td>
<td>81%</td>
</tr>
<tr>
<td>5y</td>
<td>3263</td>
<td>78%</td>
</tr>
<tr>
<td>10y</td>
<td>2009</td>
<td>69%</td>
</tr>
<tr>
<td>15y</td>
<td>1158</td>
<td>60%</td>
</tr>
<tr>
<td>20y</td>
<td>554</td>
<td>50%</td>
</tr>
<tr>
<td>25y</td>
<td>227</td>
<td>44%</td>
</tr>
</tbody>
</table>

N = 5890

**Graft Survival by Age Group**

- **Adult (n=4827)**
  - 1y: 83%
  - 3y: 77%
  - 5y: 71%
  - 10y: 69%
  - 15y: 63%
  - 20y: 59%
  - 25y: 57%

- **Children (n=1063)**
  - 1y: 87%
  - 3y: 78%
  - 5y: 68%
  - 10y: 58%
  - 15y: 46%
  - 20y: 39%
  - 25y: 34%

P<0.001
Graft Survival by Type of Graft [Deceased Donors]

**All Grafts (N= 5784)**

- **Split (n=646)**
  - Year 1: 87%
  - Year 3: 79%
  - Year 5: 70%
  - Year 10: 61%

- **Reduced (n=372)**
  - Year 1: 86%
  - Year 3: 78%
  - Year 5: 69%
  - Year 10: 59%

- **Whole (n=4766)**
  - Year 1: 84%
  - Year 3: 62%
  - Year 5: 55%
  - Year 10: 50%

**Children (N= 977)**

- **Split (n=325)**
  - Year 1: 88%
  - Year 3: 82%
  - Year 5: 79%
  - Year 10: 69%

- **Reduced (n=340)**
  - Year 1: 88%
  - Year 3: 82%
  - Year 5: 77%
  - Year 10: 60%

- **Whole (n=312)**
  - Year 1: 86%
  - Year 3: 75%
  - Year 5: 67%
  - Year 10: 56%

**Adult (N= 4807)**

- **Split (n=321)**
  - Year 1: 87%
  - Year 3: 78%
  - Year 5: 68%
  - Year 10: 58%

- **Reduced (n=32)**
  - Year 1: 84%
  - Year 3: 76%
  - Year 5: 66%
  - Year 10: 48%

- **Whole (n=4454)**
  - Year 1: 84%
  - Year 3: 78%
  - Year 5: 68%
  - Year 10: 48%

**Type of Graft**
- **Split (n=646)**
- **Reduced (n=372)**
- **Whole (n=4766)**

**P = NS**
All Deceased Donor Grafts Survival by Year of Transplant

Graft Survival (%)

Time Post-Transplant (years)

Deceased Donor Split Liver Grafts by Era

Graft Survival (%)

Time Post-Transplant (years)
Indication for Retransplantation

N = 440 (398 2nd grafts, 40 3rd grafts & 2 4th graft)

**Age Group**

**Children**
(n= 149)

**Adults**
(n= 291)

- Recurrent PBC/PSC/CAH:AI
- Recurrent HBV /HCV
- Rejection
- Vascular
- Other
- PNF/poor graft function
- Biliary

**Click Here** to go to pageContents
Indication for Retransplantation

N = 440 (398 2nd grafts, 40 3rd grafts & 2 4th graft)

Children (n=149)

Adults (n=291)
Section 5

Cause of Patient Death
Causes of Death

All Patients (N = 1519)

- Operative
- Respiratory
- Cerebrovascular
- Cardiovascular
- Gastrointestinal
- Sepsis
- Malignancy - recurrent
- Malignancy - de novo
- Recurrent HBV / HCV
- Rejection
- Other*
- Miscellaneous*

* See Appendix V for details

Graft failure

- Recurrent HBV / HCV
- Rejection
- Other*
- Miscellaneous*

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SECTION 5: CAUSE OF PATIENT DEATH
Causes of Death in Adults
N = 1354

- Operative: 12%
- Respiratory: 18%
- Cerebrovascular: 6%
- Cardiovascular: 4%
- Sepsis: 5%
- Malignancy - recurrent: 13%
- Malignancy - de novo: 13%
- Recurrent HBV / HCV: 14%
- Rejection: 7%
- Other: 4%
- Miscellaneous: 11%

Causes of Death in Children
N = 165

- Gastrointestinal: 18%
- Sepsis: 11%
- Malignancy - recurrent: 7%
- Malignancy - de novo: 8%
- Recurrent HBV / HCV: 13%
- Rejection: 6%
- Other: 2%
- Miscellaneous: 6%

* See Appendix V for details
Cause of Death by Time Post Transplant

<table>
<thead>
<tr>
<th>Time Post Transplant</th>
<th>Operative</th>
<th>Respiratory</th>
<th>Sepsis</th>
<th>Cardiac</th>
<th>Malignancy - de novo</th>
<th>Malignancy - recurrent</th>
<th>Gastrointestinal</th>
<th>Recurrent HBV / HCV</th>
<th>Rejection</th>
<th>Other [graft failure]</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 7d</td>
<td>133 (9%)</td>
<td>119 (8%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8d - 1m</td>
<td>163 (11%)</td>
<td>104 (7%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1m - 6m</td>
<td>340 (22%)</td>
<td>269 (18%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6m - 1y</td>
<td>193 (13%)</td>
<td>198 (13%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1y - 5y</td>
<td>193 (13%)</td>
<td>198 (13%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5y - 10y</td>
<td>193 (13%)</td>
<td>198 (13%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10y - 15y</td>
<td>193 (13%)</td>
<td>198 (13%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;15y</td>
<td>193 (13%)</td>
<td>198 (13%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* See Appendix V for details
SECTION 5: CAUSE OF PATIENT DEATH

**Children (N=165)**

- Operative: 25 (15%)
- Respiratory: 27 (16%)
- Cerebrovascular: 32 (19%)
- Cardiovascular: 9 (5%)
- Sepsis: 29 (18%)
- Malignancy - de novo: 16 (10%)
- Malignancy - recurrent: 6 (4%)
- Recurrent HBV / HCV: 21 (12%)

**Adult (N=1354)**

- Operative: 108 (8%)
- Respiratory: 92 (7%)
- Cerebrovascular: 131 (10%)
- Cardiovascular: 95 (7%)
- Sepsis: 311 (23%)
- Malignancy - de novo: 253 (19%)
- Malignancy - recurrent: 187 (14%)
- Recurrent HBV / HCV: 177 (13%

Legend:
- Blue: Operative
- Yellow: Gastrointestinal
- Red: Sepsis
- Green: Respiratory
- Orange: Other [graft failure]
- Magenta: Cardiovascular
- Teal: Malignancy - recurrent
- Gray: Malignancy - de novo
- Purple: Miscellaneous

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Section 6
Deceased Donor Information
## Deceased Donation by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>QLD</th>
<th>NSW/ACT</th>
<th>VIC/TAS</th>
<th>SA/NT</th>
<th>WA</th>
<th>NZ</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>33</td>
<td>40/3</td>
<td>41/5</td>
<td>31/1</td>
<td>25</td>
<td>23</td>
<td>203</td>
</tr>
<tr>
<td>2009</td>
<td>35</td>
<td>46/4</td>
<td>36/5</td>
<td>28/2</td>
<td>15</td>
<td>33</td>
<td>204</td>
</tr>
<tr>
<td>2010</td>
<td>30</td>
<td>55/8</td>
<td>53/6</td>
<td>18/2</td>
<td>17</td>
<td>32</td>
<td>221</td>
</tr>
<tr>
<td>2011</td>
<td>44</td>
<td>52/7</td>
<td>49/3</td>
<td>22/2</td>
<td>20</td>
<td>30</td>
<td>229</td>
</tr>
<tr>
<td>2012</td>
<td>46</td>
<td>50/7</td>
<td>52/10</td>
<td>21/6</td>
<td>20</td>
<td>28</td>
<td>240</td>
</tr>
<tr>
<td>2013</td>
<td>40</td>
<td>66/5</td>
<td>54/7</td>
<td>23/5</td>
<td>33</td>
<td>25</td>
<td>258</td>
</tr>
<tr>
<td>2014</td>
<td>44</td>
<td>45/7</td>
<td>62/8</td>
<td>27/4</td>
<td>25</td>
<td>32</td>
<td>254</td>
</tr>
<tr>
<td>2015</td>
<td>48</td>
<td>72/8</td>
<td>52/7</td>
<td>26/4</td>
<td>30</td>
<td>41</td>
<td>288</td>
</tr>
<tr>
<td>2016</td>
<td>69</td>
<td>74/12</td>
<td>61/4</td>
<td>28/4</td>
<td>33</td>
<td>51</td>
<td>334</td>
</tr>
<tr>
<td>2017</td>
<td>56</td>
<td>69/4</td>
<td>58/12</td>
<td>20/3</td>
<td>34</td>
<td>48</td>
<td>304</td>
</tr>
</tbody>
</table>

## Grafts from deceased donors

![Graph showing the number of grafts transplanted, cadaveric donors, waiting list, and DCD by year from 2007 to 2017.](chart.png)

- **Cadaveric donors**
- **Grafts transplanted**
- **Waiting list - 31 Dec**
- **DCD**

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SECTION 6: DECEASED DONOR INFORMATION
Donor Age by Era
N = 5335

Graft Survival by Donor Age
N = 5658
Section 7

Living Donor Transplantation
## Living Donor Transplantation

**N = 105**

<table>
<thead>
<tr>
<th>Donor relationship</th>
<th>Child [n=85]</th>
<th>Adult [n=20]*</th>
<th>All [n=105]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Donor gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>45</td>
<td>13</td>
<td>58</td>
</tr>
<tr>
<td>Female</td>
<td>40</td>
<td>7</td>
<td>47</td>
</tr>
<tr>
<td><strong>Donor age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>34.5y</td>
<td>31.7y</td>
<td>33.8y</td>
</tr>
<tr>
<td>Range</td>
<td>19.0 - 54.5y</td>
<td>18.3 - 54.4y</td>
<td>18.3 - 54.5y</td>
</tr>
<tr>
<td><strong>Donor relationship</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>23</td>
<td>-</td>
<td>23</td>
</tr>
<tr>
<td>Father</td>
<td>35</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Son</td>
<td>-</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Daughter</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Grandmother</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Grandfather</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Sister</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Brother</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Aunt</td>
<td>8</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Uncle</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Family friend</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Cousin</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Spouse</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* 4 x whole liver domino transplant

### Recipient Age Group

<table>
<thead>
<tr>
<th>Patient Survival</th>
<th>n= 85</th>
<th>n= 20</th>
<th>Total n= 105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child</td>
<td>85</td>
<td>20</td>
<td>105</td>
</tr>
<tr>
<td>Adult</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

### Survival vs Time Post-Transplant

- **All Patients (n= 98)**
  - (98 patients received LD graft as first graft)
- **All Grafts (n= 105)**
  - [98 x 1", 6 x 2", 1 x, 3""]
- **Paediatric Patient Survival (n= 85)**
- **Adult Patient Survival (n= 20)**
Section 8

Waiting List
### Waiting List Activity

[ Data 1/1/13 - 31/12/17]

#### Activity

<table>
<thead>
<tr>
<th>Listed at 1 January Activated</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>186</td>
<td>164</td>
<td>206</td>
<td>211</td>
<td>161</td>
</tr>
<tr>
<td>Paediatric</td>
<td>360</td>
<td>407</td>
<td>404</td>
<td>406</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>546</td>
<td>571</td>
<td>610</td>
<td>617</td>
<td>416</td>
</tr>
</tbody>
</table>

#### Outcome of Initial Urgent Listing

- **Patient declined, malignancy, drug use, infection, temporary delist for further investigations, medical**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplanted</td>
<td>284</td>
<td>276</td>
<td>316</td>
<td>373</td>
<td>337</td>
</tr>
<tr>
<td>Died on list</td>
<td>98</td>
<td>87</td>
<td>83</td>
<td>83</td>
<td>73</td>
</tr>
<tr>
<td>Too sick</td>
<td>11</td>
<td>10</td>
<td>5</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Tumour progression</td>
<td>16</td>
<td>15</td>
<td>20</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Improved</td>
<td>24</td>
<td>18</td>
<td>17</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
<td>26*</td>
<td>20*</td>
<td>22*</td>
<td>6</td>
</tr>
<tr>
<td>Active at 31 Dec</td>
<td>164</td>
<td>206</td>
<td>211</td>
<td>161</td>
<td>154</td>
</tr>
</tbody>
</table>

#### Outcome of Initial Urgent Listing by Category

**Category 1**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>2013 (n=19)</th>
<th>2014 (n=8)</th>
<th>2015 (n=25)</th>
<th>2016 (n=20)</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>17</td>
<td>14</td>
<td>20</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Transplanted</td>
<td>11 (74%)</td>
<td>6 (88%)</td>
<td>21 (95%)</td>
<td>17 (95%)</td>
<td>10 (88%)</td>
</tr>
<tr>
<td>Improved</td>
<td>3 (15%)</td>
<td>2 (100%)</td>
<td>2 (100%)</td>
<td>2 (100%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Died / Too Sick</td>
<td>5 (27%)</td>
<td>1 (50%)</td>
<td>3 (13%)</td>
<td>2 (10%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Other Treatment</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Category 2**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>2013 (n=29)</th>
<th>2014 (n=22)</th>
<th>2015 (n=22)</th>
<th>2016 (n=25)</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>19</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Transplanted</td>
<td>22 (89%)</td>
<td>18 (95%)</td>
<td>20 (95%)</td>
<td>21 (100%)</td>
<td>18 (100%)</td>
</tr>
<tr>
<td>Improved</td>
<td>4 (29%)</td>
<td>3 (14%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Died / Too Sick</td>
<td>2 (8%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other Treatment</td>
<td>1 active</td>
<td>1 active</td>
<td>1 active</td>
<td>1 active</td>
<td>1 active</td>
</tr>
</tbody>
</table>

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### Outcome by Blood Group

<table>
<thead>
<tr>
<th>Blood Group</th>
<th>A</th>
<th>O</th>
<th>B</th>
<th>AB</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=</td>
<td>224 (39%)*</td>
<td>257 (44%)</td>
<td>70 (12%)</td>
<td>27 (5%)</td>
<td>578</td>
</tr>
<tr>
<td>Not transplanted</td>
<td>92</td>
<td>104</td>
<td>37</td>
<td>8</td>
<td>241</td>
</tr>
<tr>
<td>Transplanted</td>
<td>132 (59%)**</td>
<td>153 (60%)</td>
<td>33 (47%)</td>
<td>19 (70%)</td>
<td>337 (58%)</td>
</tr>
</tbody>
</table>

* % of total number listed
** % of blood group

### Waiting Time to Transplant 2017

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Median Waiting Time (months)</th>
<th>n</th>
<th>Waiting Time (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>68d</td>
<td>132 (39%)</td>
<td>19 (6%)</td>
</tr>
<tr>
<td>AB</td>
<td>14d</td>
<td>153 (45%)</td>
<td>33 (10%)</td>
</tr>
<tr>
<td>B</td>
<td>31d</td>
<td>19 (6%)</td>
<td>33 (10%)</td>
</tr>
<tr>
<td>O</td>
<td>67d</td>
<td>153 (45%)</td>
<td>33 (10%)</td>
</tr>
</tbody>
</table>

* P = 0.033
Waiting Time by Outcome

Median waiting time to transplant = 58d (0-63m)

Median waiting time listed patients 31/12/17 = 128d (3d-126m)

Median waiting time to transplant

Patient Outcome

Waiting Time by Outcome & Blood Group

P = 0.006

Patient Outcome

P = 0.006

Blood Type

Median = 85d A

Median = 42d AB

Median = 71d B

Median = 97d O
Section 9

Liver Transplantation and Cancer
Cancer in Liver Transplant Recipients

**N = 5448**

<table>
<thead>
<tr>
<th>At Tx</th>
<th>Total number pts. transplanted = 5448</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver Cancer as indication for Transplant</td>
<td>508 (9%) 511 Ca</td>
</tr>
<tr>
<td>Liver Ca as a Secondary Diagnosis</td>
<td>751 (14%) 754 Ca</td>
</tr>
<tr>
<td>Total</td>
<td>1256* (23%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post Tx</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent Liver Ca</td>
<td>165 (12% pts with Ca at Tx)</td>
</tr>
<tr>
<td>De Novo Ca</td>
<td>439 (7%) 471 Ca</td>
</tr>
<tr>
<td>Skin Ca</td>
<td>844 (15%)</td>
</tr>
<tr>
<td>Total</td>
<td>1448 (27%)</td>
</tr>
</tbody>
</table>

**Liver Cancer as Primary Diagnosis**  
**N = 508/5448 (9%)**

<table>
<thead>
<tr>
<th>TYPE OF CA</th>
<th>No</th>
<th>DIED</th>
<th>DIED OF THIS CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEPATOCELLULAR CA</td>
<td>453</td>
<td>106</td>
<td>52 (12%)</td>
</tr>
<tr>
<td>HEPATOBlastoma</td>
<td>32</td>
<td>5</td>
<td>4 (14%)</td>
</tr>
<tr>
<td>FIBROLAMELLAR</td>
<td>7</td>
<td>5</td>
<td>2 (29%)</td>
</tr>
<tr>
<td>EPITHELOID HAEMANGIOENDOTHELIOMA</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CHOLANGIOCARCINOMA</td>
<td>5</td>
<td>2</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>CARCINOID</td>
<td>4</td>
<td>4</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>HEPATOCELLULAR MALIGNANT NEOPLASM</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ANGIOSARCOMA</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>GASTRINOMA</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>PANCREATIC ISLET CELL</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>ERYTHROID LEUKAEMIA</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>511* (9% of pts)</td>
<td>126 (25% of those with PCa)</td>
<td>67 (13% of those with PCa)</td>
</tr>
</tbody>
</table>

* 3 pts had primary and a secondary liver cancer; 3 pts had multiple secondary liver cancers
Overall Survival
Primary Liver Cancer
N = 508/5448 (9% of pts transplanted)

Overall Survival
Primary Liver Cancer
N = 508*/5448 (9%)

Number at risk
506 198 81 25 6 2

Number at risk
Cholangiocarcinoma 5 1 1 0 0 0
HCC 448 173 72 21 4 0
Hepatoblastoma 32 15 4 2 1 1
Lamella variant 7 5 3 1 0 0
Other liver malignan 14 4 1 1 1 1

* 3 pts had two primary liver cancers
Primary Liver Cancer Incidence
N = 508/5448 (9%)

Liver Cancer as a Secondary Diagnosis
N=751/5448 (14% pts)

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>No</th>
<th>Died</th>
<th>Died of This Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEPATOCELLULAR CA*</td>
<td>694</td>
<td>195</td>
<td>59 (9%)</td>
</tr>
<tr>
<td>CHOLANGIO CA</td>
<td>46</td>
<td>34</td>
<td>22 (48%)</td>
</tr>
<tr>
<td>OTHER</td>
<td>7</td>
<td>5</td>
<td>2 (29%)</td>
</tr>
<tr>
<td>FIBROLAMELLAR</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HEPATOMLASTOMA*</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>754* Ca in 751 pts</td>
<td>236 (31% of pts with SCa)</td>
<td>83 (12% of pts with SCa)</td>
</tr>
</tbody>
</table>

* 3 patients had 2 secondary cancers
Overall Survival
Liver Cancer as a Secondary Diagnosis
N = 751/5448 (14% pts)

Number at risk 749 367 183 65 13 3

Liver Cancer as a Secondary Diagnosis
N = 751/5448 (14% pts)
Liver Cancer - (Primary or Secondary Diagnosis)
N= 1306/5448 (23%)

### Section 9: Liver Transplantation and Cancer

**Patient Actuarial Survival**

**Benign Disease vs Pre Transplant Liver Malignancy**

N = 5448

<table>
<thead>
<tr>
<th>TYPE OF CA</th>
<th>No.</th>
<th>DIED</th>
<th>DIED OF THIS CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEPATOCELLULAR CA*</td>
<td>1198</td>
<td>301</td>
<td>111 (9%)</td>
</tr>
<tr>
<td>CHOLANGIOCARCINOMA*</td>
<td>49</td>
<td>35</td>
<td>23 (47%)</td>
</tr>
<tr>
<td>HEPATOBLASTOMA*</td>
<td>35</td>
<td>7</td>
<td>4 (11%)</td>
</tr>
<tr>
<td>FIBROLAMELLAR</td>
<td>10</td>
<td>5</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>EPITHELOID HAEMANGIOENDOTHELIOMA</td>
<td>7</td>
<td>1</td>
<td>1 (14%)</td>
</tr>
<tr>
<td>ADENOCARCINOMA</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CARCINOID</td>
<td>4</td>
<td>4</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>ANGIOSARCOMA</td>
<td>2</td>
<td>2</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>GASTRINOMA</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>PANCREATIC ISLET CELL</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>ERYTHROID LEUKAEMIA</td>
<td>1</td>
<td>1</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>HEPATOCELLULAR MALIGNANT NEOPLASM (NOS)</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**TOTALS**

1313* Ca in 1306 pts  
361 (27% of those with Ca)  
150 (11% of those with Ca at Tx)

* 4 patients had 2 secondary cancers; 3 patients had a primary and secondary cancer

---

**Benign vs Malignant Survival**

![Graph showing survival rates for benign and malignant conditions](image)

Benign: 4094, 1758, 561, 12
Malignant: 1297, 265, 20, 0

p<0.0001
Liver Cancer at Transplantation
N = 1306/5448 (23%)

[Bar graph showing HCC (n=1198) and Other (n=115*) over three time periods: 1985-1995, 1996-2005, 2006-2017.]

* 4 patients had 2 secondary cancers; 3 patients had a primary and secondary cancers

HCC at Transplantation

### De Novo Non Skin Cancer

**N = 439/5448 (8%)**

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>No</th>
<th>Male</th>
<th>Female</th>
<th>Age of pts (yrs)</th>
<th>Time to diagnosis (mths)</th>
<th>Died of This Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alimentary*</td>
<td>168</td>
<td>121</td>
<td>47</td>
<td>5 – 83 (m 59)</td>
<td>3 – 316 (m 79)</td>
<td>73 (43%)</td>
</tr>
<tr>
<td>Lymphoma*</td>
<td>114</td>
<td>64</td>
<td>50</td>
<td>1 – 79 (m 50)</td>
<td>1 – 283 (m 66)</td>
<td>43 (38%)</td>
</tr>
<tr>
<td>Genitourinary*</td>
<td>70</td>
<td>44</td>
<td>26</td>
<td>21 – 82 (m 61)</td>
<td>1 – 350 (m 81)</td>
<td>7 (10%)</td>
</tr>
<tr>
<td>Respiratory*</td>
<td>52</td>
<td>40</td>
<td>12</td>
<td>29 – 80 (m 60)</td>
<td>7 – 278 (m 102)</td>
<td>37 (71%)</td>
</tr>
<tr>
<td>Breast*</td>
<td>30</td>
<td>1</td>
<td>29</td>
<td>30 – 74 (m 55)</td>
<td>11 – 282 (m 98)</td>
<td>11 (37%)</td>
</tr>
<tr>
<td>Endocrine</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>36 – 70 (m 55)</td>
<td>35 – 346 (m 82)</td>
<td>3 (27%)</td>
</tr>
<tr>
<td>CNS*</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>16 – 75 (m 65)</td>
<td>14 – 212 (m 93)</td>
<td>6 (75%)</td>
</tr>
<tr>
<td>Miscellaneous*</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>57 – 73 (m 67)</td>
<td>61 – 191 (m 96)</td>
<td>4 (67%)</td>
</tr>
<tr>
<td>Leukaemia*</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>3 – 66 (m 49)</td>
<td>16 – 157 (m 37)</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>Kaposi’s</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>32 – 76 (m 56)</td>
<td>2 – 254 (m 17)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>471</strong></td>
<td><strong>291</strong></td>
<td><strong>180</strong></td>
<td><strong>1 – 83 (m 59)</strong></td>
<td><strong>1 – 350 (m 64)</strong></td>
<td><strong>186 (39% of pts with Ca)</strong></td>
</tr>
</tbody>
</table>

* 29 patients had 2 de novo cancer, 3 patients had 3 de novo cancers

m=median
Time to Diagnosis of De Novo Non Skin Cancer (3m - >15y)  
N = 5448

471 cancers in 439 pts (8% of all pts)

- Alimentary tract
- Breast
- CNS
- Endocrine
- Genitourinary
- Kaposi's sarcoma
- Leukaemia
- Lymphoma
- Miscellaneous
- Respiratory

Time to Diagnosis of Any Non Skin Cancer (3m - >10y)  
N = 5448

471 cancers in 439 pts (8% of all pts)

- Adult
- Child

DATA TO 31/12/2017  
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SECTION 9 : LIVER TRANSPLANTATION AND CANCER
Time to Diagnosis of Lymphoma (3m ->10yrs)

Lymphoma - Adults
n = 96 (21% adults with de novo Ca)

Lymphoma - Children
n = 18 (86% children with de novo Ca)

De Novo Non Skin Cancer
N = 439/5448 (8%)
Pre Transplant Disease and De Novo Non Skin Cancer
N = 439 (470 Ca)/5448 pts (8%)

HCV - 103/439
24% of de novo Ca

Alcohol - 92/439
21% of de novo CA
Pre Transplant Primary Liver Disease and De Novo Non Skin Cancer
N = 439 (470 Ca)/5448 pts (8%)

De Novo Non Skin Cancer - Genitourinary Tract Incidence
N = 70/470 cancers (15%)
Pre Transplant Primary Disease and Alimentary Cancer
N = 439 (470 Ca)/5448 pts (8%)

De Novo Non Skin Cancer - Alimentary Tract Incidence
N = 165 (166 ca)/439 pts (38%)
De Novo Non Skin Cancer - Respiratory Cancer Incidence

Respiratory cancers
53/439 pts (12%)

- HCV: 17
- Malignancy: 13
- Alcohol: 6
- Metabolic: 3
- Other: 2
- HBV: 3
- Fulminant: 3
- AI: 1
- PBC: 2
- PSC: 3

Respiratory cancers
53/439 pts (12%)

- <3mths: 20
- 3-12mths: 9
- 1-3yrs: 7
- 3-5yrs: 9
- 5-10yrs: 16
- >10yrs: 20

De Novo Non Skin Cancer - Respiratory Cancer Incidence

Respiratory cancers
53/439 pts (12%)

- Lung: 48
- Larynx: 4
- Pharynx: 1
Time to Melanoma Skin Cancer Development Post Tx.
N = 5448
48 (49 ca) (0.9% of all pts)

Time to lst Skin Cancer Development
844/5448 (16% of all pts)
Time to Any Skin Cancer Development
844/5448 (15% of all pts)

844 (15%) pts developed skin cancer post Tx. 400 (47%) pts have multiple skin cancer types.

Cumulative Risk of Diagnosis of Skin or Non Skin Cancer Following Liver Tx.
1985-2017

Patients at Risk
(5448)
Appendix I

Liver Transplant Units of Australia and New Zealand

Australian National Liver Transplant Unit
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN NSW 2050

The Children's Hospital at Westmead
Hawkesbury Road
WESTMEAD NSW 2145

Victorian Liver Transplantation Unit
The Austin Hospital
Studley Road
HEIDELBERG VIC 3084

The Royal Children's Hospital
Flemington Road
PARKVILLE VIC 3052

Queensland Liver Transplant Service
Princess Alexandra Hospital
Ipswich Road
WOOLLOONGABBA QLD 4102

The Lady Cilento Children's Hospital
Stanley Street
SOUTH BRISBANE QLD 4101

South Australian Liver Transplant Unit
Flinders Medical Centre
Flinders Drive
BEDFORD PARK SA 5042

WA Liver Transplantation Service
Sir Charles Gairdner Hospital
Verdun Street
NEDLANDS WA 6009

New Zealand Liver Transplant Unit
Auckland City Hospital
Park Road
Auckland
New Zealand
http://www.livers.org.nz/

and

Starship Children's Hospital
Park Road
AUCKLAND
New Zealand

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APPENDIX
## ANZLTR PRIMARY Diagnosis
### Metabolic disorders by Age Group

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Age group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Child</td>
<td>Adult</td>
</tr>
<tr>
<td>α-1 Antitrypsin deficiency</td>
<td>39</td>
<td>56</td>
</tr>
<tr>
<td>Crigler-Najjar</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Familial amyloid polyneuropathy</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Glycogen storage disease</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Haemochromatosis</td>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>Homozygous hypercholesterolemia</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Maple syrup urine disease</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Indian childhood cirrhosis</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other *</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>Primary hyperoxaluria</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Tyrosinemia</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Urea cycle disorders**</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Wilsons disease</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>135</td>
<td>193</td>
</tr>
</tbody>
</table>

* Amyloidosis 1  
  Bile acid transport disorder 3  
  Protein C deficiency 3  
  Propionic acidemia 6  
  Methylmalonic acidemia 2  
  Familial immunodeficiency 1  
  Mitochondrial disease 3  
  Porphyrina 1  
  aB Lipoprotein Amyloid 1  
  Niemann-Pick 1  

** OTC deficiency 15  
  ASL deficiency 5  
  CPS deficiency 3  
  ASS deficiency 5
## Appendix III

### ANZLTR PRIMARY Diagnosis - Other by Age Group

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Age group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Child</td>
<td>Adult</td>
</tr>
<tr>
<td>Alagille syndrome</td>
<td>36</td>
<td>10</td>
</tr>
<tr>
<td>Alagille non-syndromic</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Benign liver tumour - adenomatosis</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Benign liver tumour - hemangioma</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Caroli’s disease / congenital hepatic fibrosis</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Choledocal cyst</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Cholestatic disease-Other</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Chronic Budd Chiari</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Congenital biliary fibrosis</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ductopenia</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Granulomatous hepatitis / sarcoidosis</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Histiocytosis X</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Hereditary haemorrhagic telengectasia / OWRD</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Neonatal hepatitis</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Nodular regenerative hyperplasia</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Polycystic liver disease</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Polycystic liver and kidney disease</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Progressive familial intrahepatic cholestasis (PFIC)</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Secondary biliary cirrhosis</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Secondary biliary cirrhosis - hepatolithiasis</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Secondary biliary cirrhosis - cystic fibrosis</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>Other - specify #</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>236</td>
</tr>
</tbody>
</table>

# Haemangiotelangiectasia
Veno-occlusive disease
Non-cirrhotic portal hypertension
Arterio-venous malformation
Oriental cholangio hepatitis
Liver trauma
Cholestatic cirrhosis parvovirus
Osler-weber-rendu disease

Biliary sclerosis
Drug induced cholestasis
Graft vs host disease
Ischaemic sclerosing cholangitis
Choledochal cyst
Langerhans cell histiocytosis
### Appendix IV

**ANZLTR PRIMARY Diagnosis**

**Fulminant Hepatic Failure by Age Group**

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Age group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children</td>
<td>Adult</td>
</tr>
<tr>
<td>Acute - Budd Chiari</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Acute - Wilson's</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Acute - α-1 -AAT</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Acute autoimmune hepatitis</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Acute unknown / unspecified</td>
<td>47</td>
<td>95</td>
</tr>
<tr>
<td>Acute - paracetamol</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Acute - other drugs</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Acute herbs / mushrooms</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Acute - hepatitis A</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Acute - hepatitis B</td>
<td>0</td>
<td>73</td>
</tr>
<tr>
<td>Acute - hepatitis non A-G</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Acute - hepatitis E</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Acute - other virus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Acute - post liver resection/trauma</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Subacute - Budd Chiari</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Subacute - Wilson's</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Subacute autoimmune hepatitis</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Subacute - drug / herbs</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Subacute - unknown / unspecified</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Subacute - hepatitis A</td>
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<td>2</td>
</tr>
<tr>
<td>Subacute - hepatitis B</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Subacute - hepatitis non A-G</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99</strong></td>
<td><strong>404</strong></td>
</tr>
</tbody>
</table>

**ANZLT REGISTRY REPORT**

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## Appendix V

### ANZLTR Causes of Patient death

<table>
<thead>
<tr>
<th>Graft failure - other</th>
<th>Age group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children</td>
<td>Adult</td>
</tr>
<tr>
<td>Vascular thrombosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatic artery</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Portal vein</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Hepatic vein</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Non thrombotic infarction</td>
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<td></td>
</tr>
<tr>
<td>Primary non function</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Massive haemorrhagic necrosis</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Recurrent disease <em>(ALD, PSC, CAH:AI)</em></td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>De novo hepatitis C</td>
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<td>2</td>
</tr>
<tr>
<td>Biliary complications</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Other <em>(PNC, immune hepatitis, outflow obstruction)</em></td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>29</strong></td>
<td><strong>88</strong></td>
</tr>
</tbody>
</table>

| Miscellaneous                                              | Children | Adult |
|                                                           |          |       |
| Multiorgan failure                                         | 11       | 88    | 99   |
| Renal failure                                              | 1        | 44    | 45   |
| Graft vs Host disease                                      | -        | 6     | 6    |
| Social *(accident, suicide, non-compliance, Rx withdrawn)* | 1        | 21    | 22   |
| Sudden death *(cause unknown)*                             | 3        | 44    | 47   |
| Other *(hyperkalaemia, motor neurone disease diabetes complications, drug reaction, progression FAP essential thrombocythemia)* | 3 | 37 | 40 |
| **TOTAL**                                                  | **19**   | **240**| **259** |

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