The Nordic Liver Transplant Registry (NLTR)

Annual report 2020

Report prepared by Espen Melum June 2021

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1. Source of data

The numbers and graphs included in the present report are based on data extracted from the Nordic Liver Transplant Registry (NLTR) in April 2021. Prior to the export, data were subjected to extensive integrity and quality control. Entry of missing data and correction of all identified errors were performed at all centers prior to the final data extraction.

2. Data content NLTR 2020

The registry comprises complete data from the liver transplantation activity at all transplantation centers in Denmark, Sweden, Norway and Finland since 1982. Before 1990, only patients that were transplanted were registered. After 1990, the registry covers all patients entered to the liver transplantation waiting list, regardless of transplantation status. From September 1994, complete waiting list data are available from all patients in addition to the transplantation details. From October 1st 2017 data on patients transplanted in Estonia are prospectively included, patients transplanted in Estonia prior to this date have been retrospectively included. All data are stored securely at Scandiatransplant in Århus (www.scandiatransplant.org).

Up to December 31st 2020, data from a total of 8897 patients had been entered into NLTR. Of these, 7796 patients had received a first liver graft, 796 (10.1%) had been transplanted more than once, and 114 (1.5%) had been transplanted more than twice. Of the 796 patients receiving a second liver graft, 7 had received their first graft outside of the Scandiatransplant area. A total of 210 living donor transplantations had been performed. Children below 18 years constituted 837 (10.7%) of the transplanted patients in the registry.

3. Transplantation activity 2020

The total number of patients who received a first liver graft in 2020 was 373 (Figure 1). Of these, 11 were combined liver-kidney transplantations. Of the first liver transplantations performed in 2020 three were living donor transplantations and one was a domino transplantation. The three living donor transplantations were performed in Copenhagen and the domino transplantation in Gothenburg. In addition, 40 re-transplantations were performed (Table 2). The total number of liver transplantations was 413, which is similar to the 415 transplants performed in 2019 and it is worth noting that there was not any reduction in transplant activity due to the ongoing pandemic and its impact on the health care services and society in general.

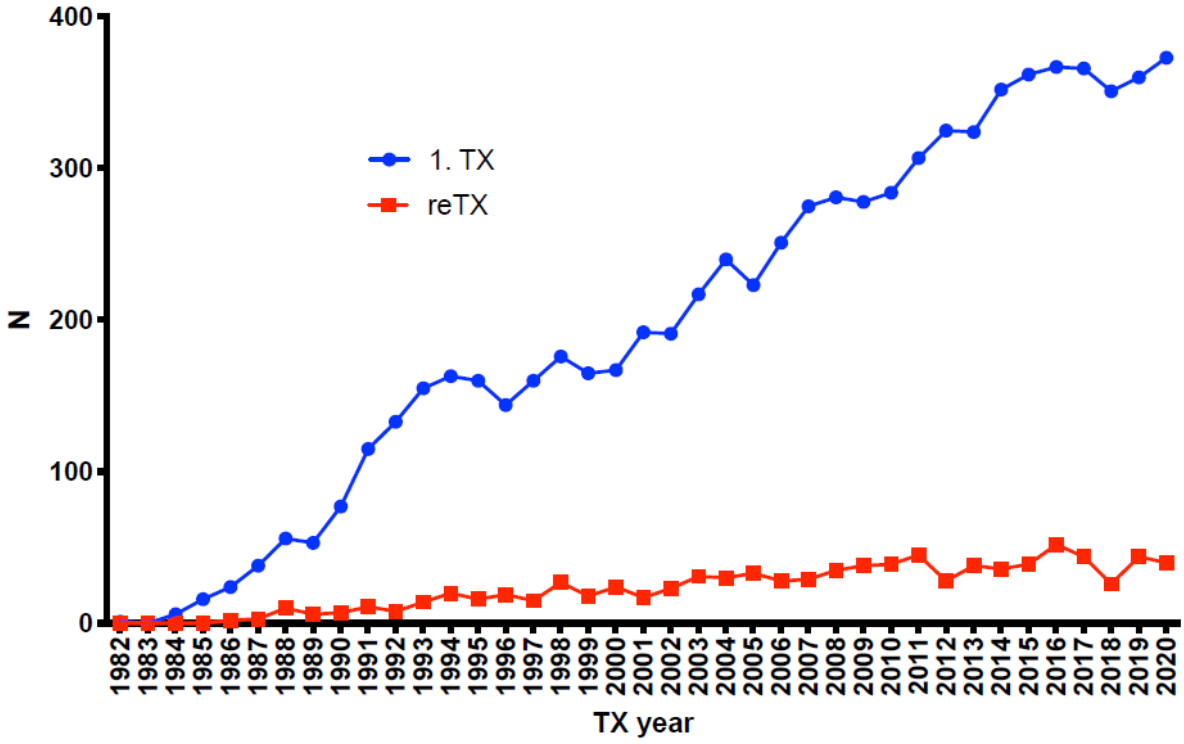

Figure 1. Number of patients receiving a liver allograft 1982-2020. The blue line represents the number of patients receiving a first liver graft while the red line represents the total number of re-transplantations.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Copenhagen	43	43	39	41	55	51	52	39	61	59
Gothenburg	66	76	72	89	86	88	84	83	80	72
Helsinki	52	48	44	56	70	54	57	60	56	71
Oslo	81	89	96	89	72	88	85	87	75	76
Stockholm	65	68	73	77	79	86	82	73	78	84
Uppsala	3	0	0	0	0					
Tartu*							6	9	10	11

Table 1. Number of first liver transplantations performed at the individual centers during the last 10 years. *Data from Tartu are only included from the time Estonia joined Scandiatransplant

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Copenhagen	9	4	3	6	3	9*	5	4	3	7
Gothenburg	16	4	9	8	8	17	10	3	15	8
Helsinki	4	4	5	3	7	7	6	6	9	4
Oslo	8	11	14	11	14	12	17	8	19	12***
Stockholm	8	5	7	8	8*	7	5	4	9	8
Tartu**							0	1	0	1

Table 2. Total number of re-transplantations performed at the individual centers during the last 10 years. * = 1 pts in 2015 and one in 2016 received their first graft outside SCTP **Data from Tartu are only included from the time Estonia joined Scandiatransplant. ***One patient retransplanted in Oslo received his first graft in Stockholm

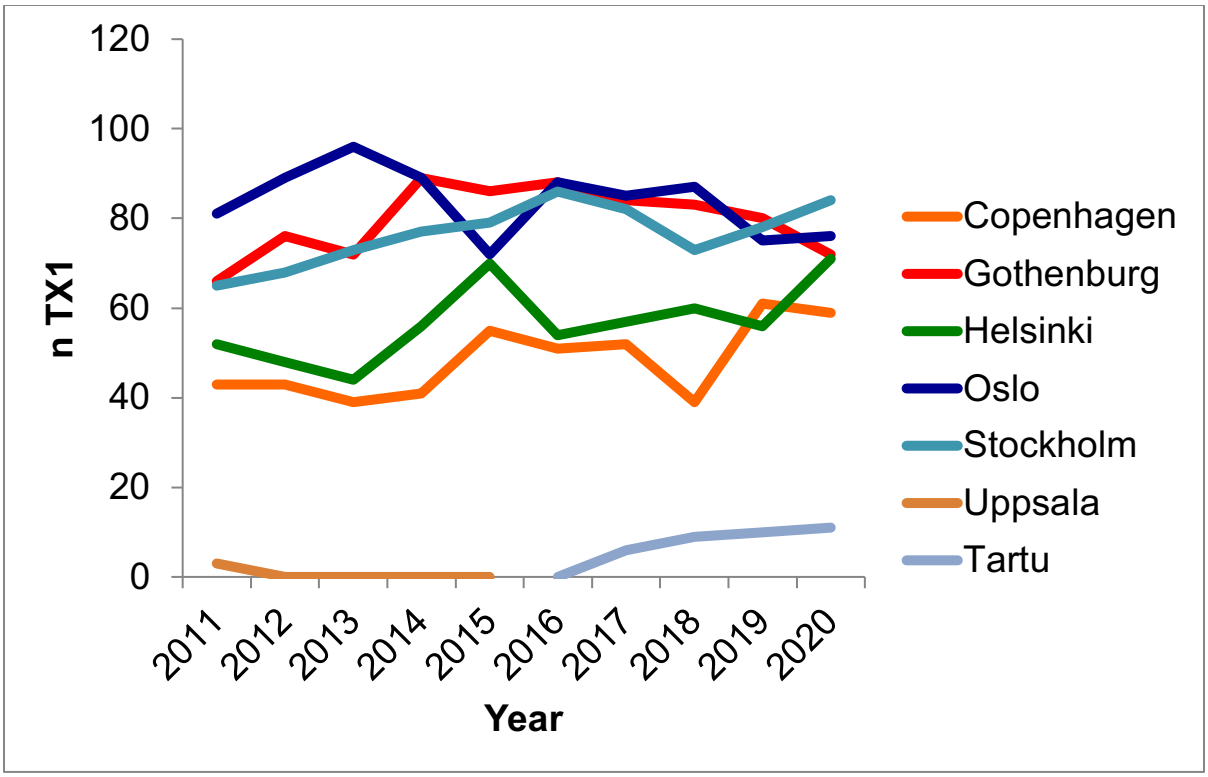

Figure 2. Number of first liver transplantations performed at the Nordic and Estonian centers that are currently performing liver transplantations.

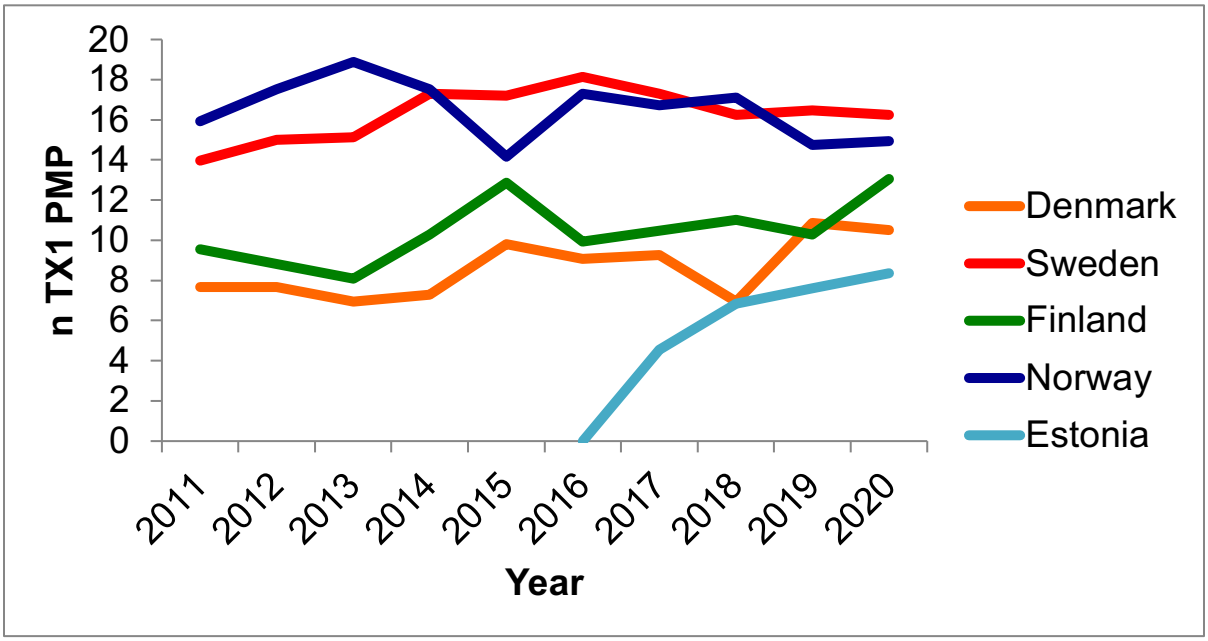

Figure 3. Number of first liver transplantations performed in the Scandiatransplant countries according to the country's population. PMP, per million population.

4. The waiting list 2020

In 2020, a total of 422 patients were entered on the waiting list for a first liver transplant (Table 3), this is an increase from the 404 entered in 2019 (Figure 4). Fifteen of the patients listed for a first liver transplant in 2020 were listed as highly urgent as first urgency. This is a marked decrease compared to previous years.

Active on waiting list	Deceased donor	Living donor	Dead	Permanent withdrawal
109	284	2	9	18

Table 3. Patients entering the waiting list in 2020 classified by outcome as of December 31st 2020.

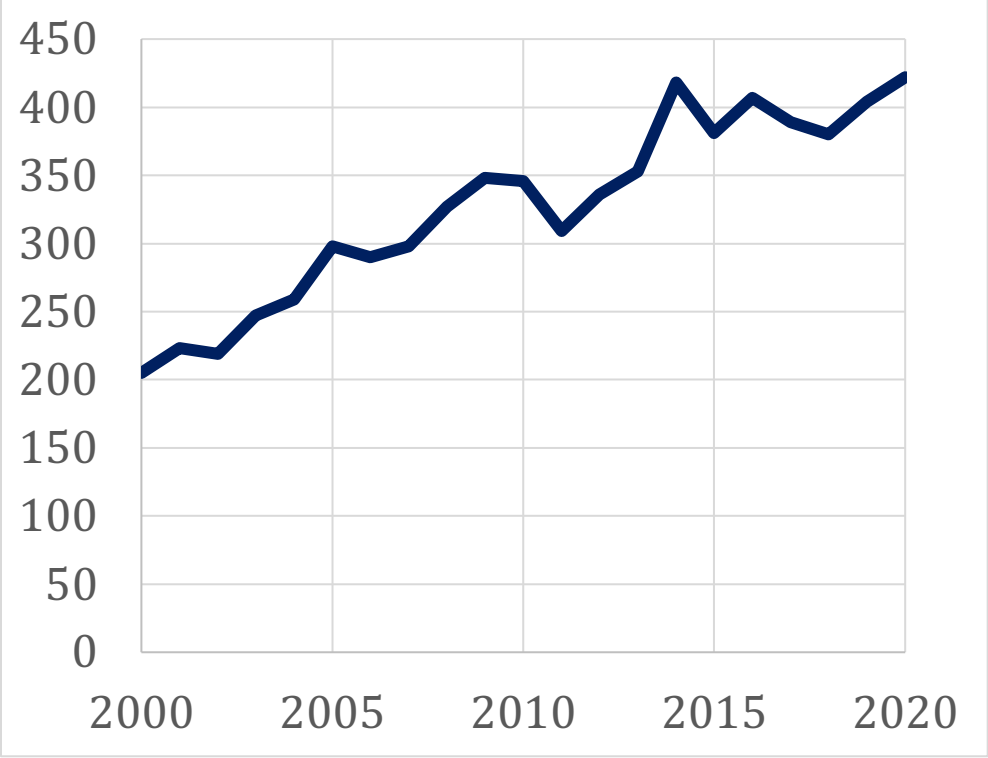

Figure 4. Number of patients entering the waiting list from 2000-2020.

The number of deaths among patients listed in 2020 for a first liver

transplant was 9 (Denmark 1, Sweden 5, Finland 0, Norway 2 and Estonia 1). The absolute number of deaths registered on the waiting list has remained stable since 1990 (Figure 5). When the deaths on the waiting list are evaluated in relation to the total liver transplantation activity in 2020 the relative number of deaths on the waiting list remains low as it has been since 2011 (Figure 6).

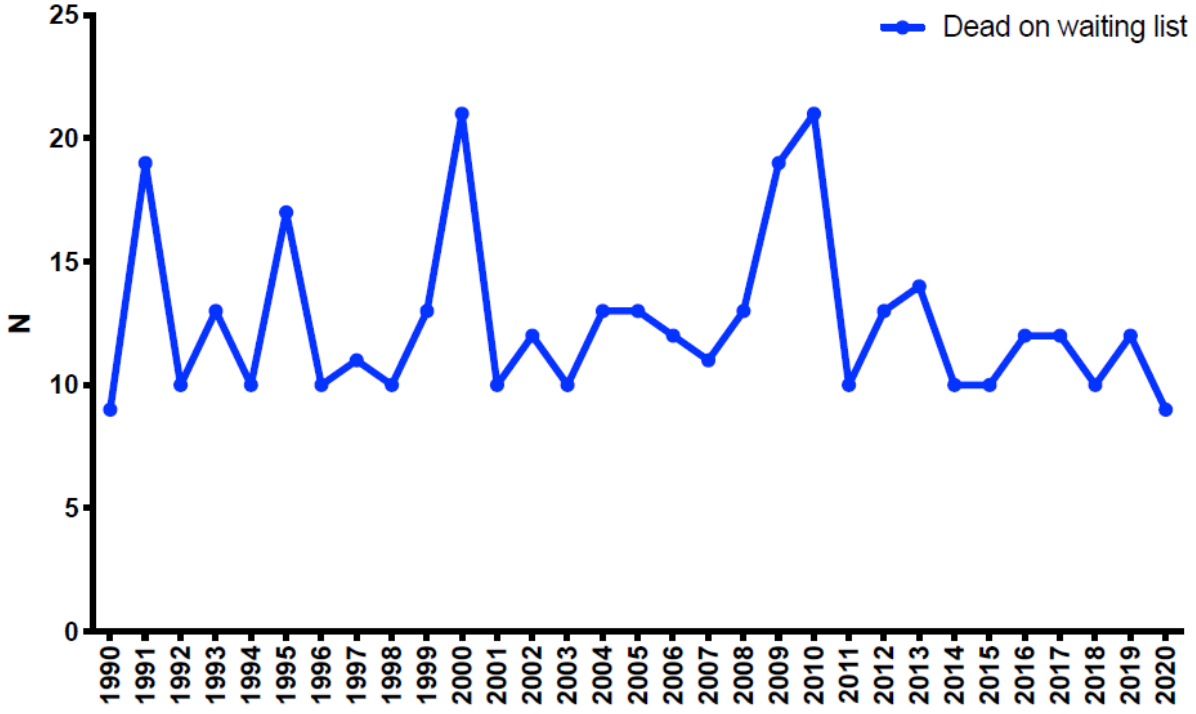

Figure 5. Number of patients registered as dead on the waiting list in the period 1990-2020.

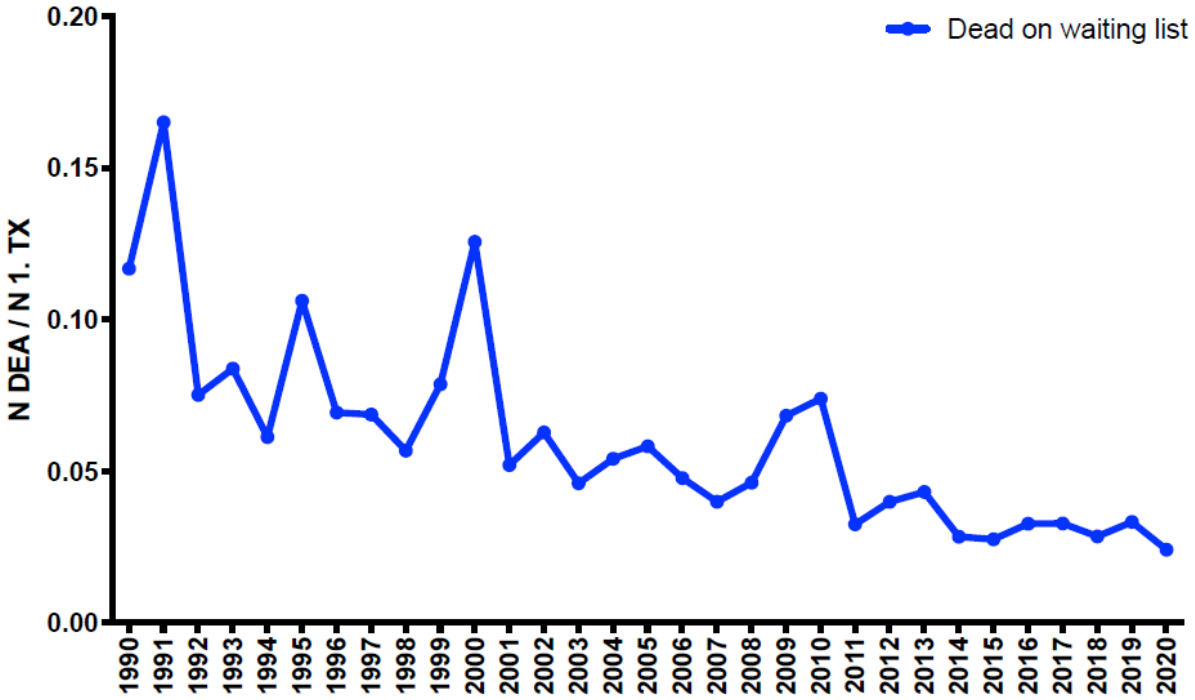

Figure 6. Number of patients registered as dead on the waiting list relative to the total transplantation activity in the period 1990-2020.

The median waiting time in 2020 was 57 days when excluding patients listed for a highly urgent liver transplantation. The differences according to different ABO blood types were as expected (Table 4) with largely similar numbers since 2010 (Figure 7).

0	***A***	***AB***	***B***
112.5 (1321)	35 (420)	34 (177)	39 (660)

Table 4. Median time on waiting list (days) for patients receiving a first liver allograft in 2020 according to ABO blood type. The number in parenthesis represents the maximum waiting time for the indicated blood type in 2020. (Patients listed as highly urgent are excluded from the calculations.)

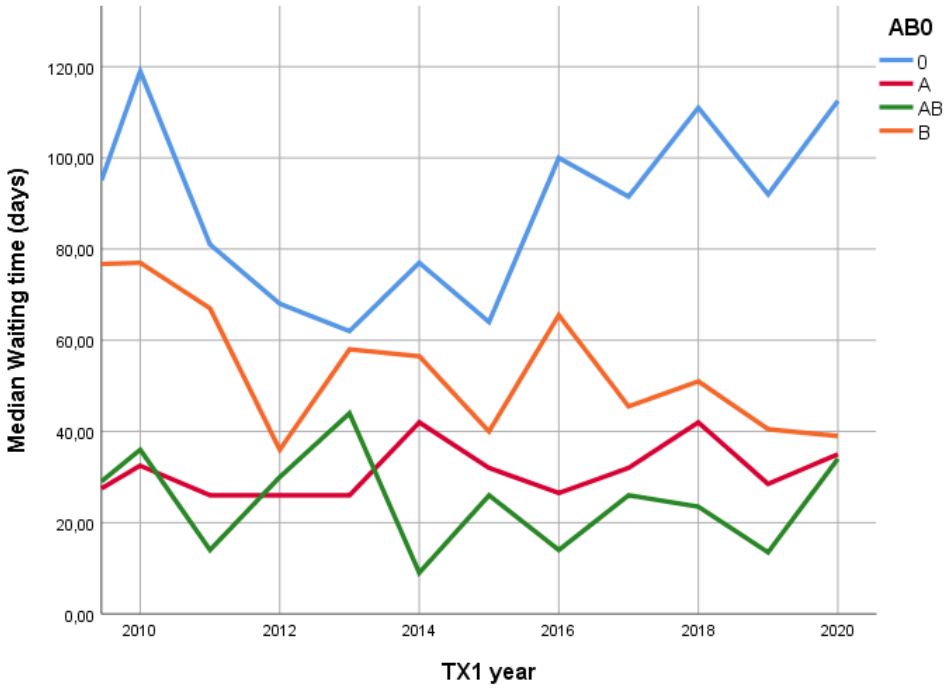

Figure 7. Median waiting time for first liver transplantation according to ABO blood type for 2010-2020. (Patients listed as highly urgent are excluded from the calculations.)

Oslo had the lowest and Gothenburg the longest waiting time in 2020 (Table 5). The waiting times saw a slight increase in Finland, Norway, Sweden and Estonia in 2020 (Figure 8). Nevertheless, the waiting times remain remarkably low compared to other programs.

Copenhagen	***Gothenburg***	***Helsinki***	***Oslo***	***Stockholm***	***Tartu***
49.5 (876)	68 (1321)	59.5 (376)	41.5 (540)	61 (743)	67.5 (156)

Table 5. Median time on waiting list (days) for patients receiving a first liver allograft in 2020 according to transplantation center. The number in parenthesis represents the maximum waiting time for the indicated center in 2020. (Patients listed as highly urgent are excluded from the calculations.)

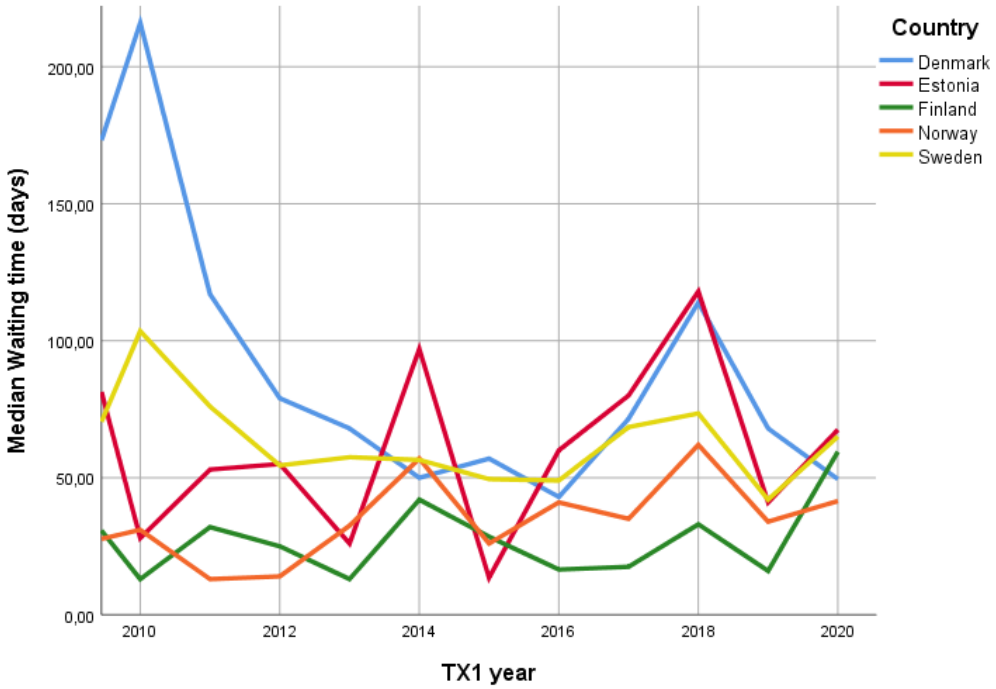

Figure 8. Median waiting time for first liver transplantation according to country for 2010-2020. (Patients listed as highly urgent are excluded from the calculations.)

5. Age of recipients and donors

The mean age of adult liver recipients (>18 years, first liver transplantation) in 2020 was 53.5 years. Mean age of children (<18 years, first liver transplantation) in 2019 was 6.3 years. Since 1990 the proportion of recipients >60 years of age at the first transplantation has gradually increased and seems to have plateaued with 32.7% of the patients in 2020 being above 60 years of age (Figure 9). The mean age of the donors has remained stable since 2010 with a median age of 56.0 years in 2020 (Figure 10).

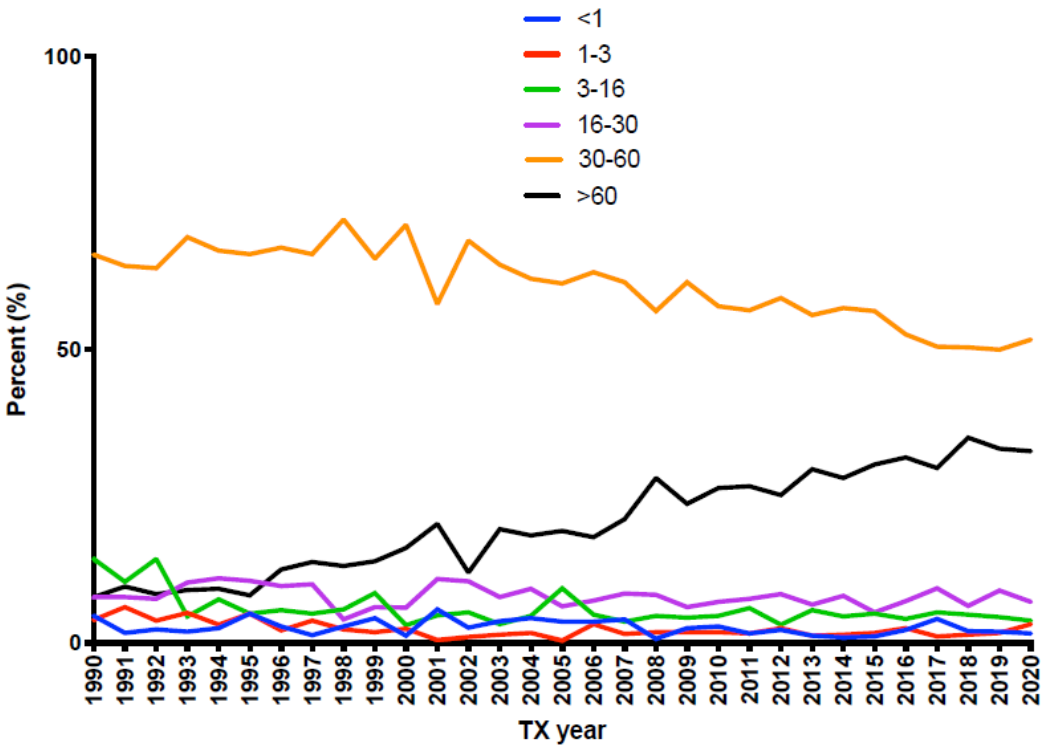

Figure 9. Proportion of liver transplants in the indicated age groups.

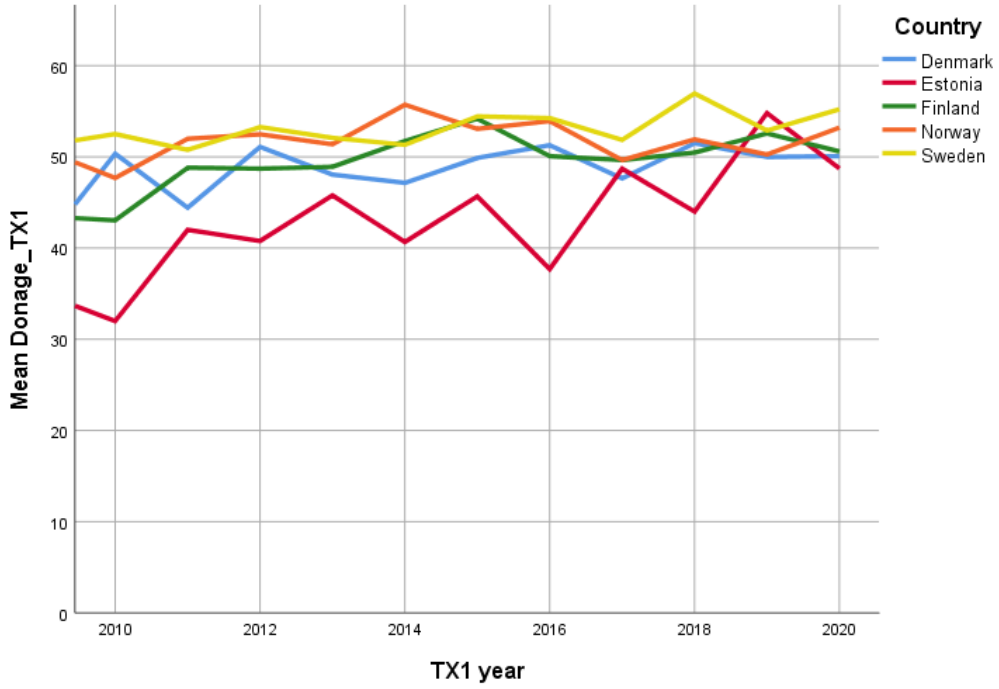

Figure 10. Mean age of donors utilized in the indicated years stratified for the different countries.

6. Diagnoses

In 2020, primary sclerosing cholangitis was again the leading indication for liver transplantation in Nordic countries (Table 6). Of the patients listed for transplantation with a primary diagnosis of hepatocellular carcinoma in 2020, 38% were also anti-HCV positive. During the last 5 years the percentage of patients listed for transplantation with a diagnosis of HCV cirrhosis has dramatically declined (Figure 11). This decline coincides with the introduction of direct acting antiviral treatment and HCV cirrhosis has moved from being a major indication in our program to a rather rare indication.

	1982-90	1991-95	1996-00	2001-05	2006-10	2011-15	2016-20	2020
Primary sclerosing cholangitis	11.1%	12.1%	15.6%	15.4%	15.8%	16.4%	17.0%	16.8%
Hepatocellular carcinoma and cirrhosis	10.8%	4.3%	6.0%	6.7%	10.7%	17.0%	15.5%	14.5%
Alcoholic cirrhosis	1.9%	8.3%	11.7%	12.7%	10.8%	12.1%	13.8%	14.0%
Metabolic disease	9.3%	8.3%	5.9%	5.2%	7.2%	7.0%	9.4%	8.8%
Cirrhosis - unknown	0.6%	2.5%	3.6%	2.7%	5.1%	6.5%	5.7%	6.4%
Acute liver failure - other	8.7%	10.4%	7.2%	6.7%	5.8%	4.9%	6.5%	5.2%
Autoimmune cirrhosis	2.8%	3.6%	3.6%	4.4%	4.3%	4.4%	4.8%	5.2%
Primary biliary cirrhosis	22.6%	14.5%	8.8%	6.9%	6.4%	5.3%	4.7%	5.0%
Others	1.2%	2.3%	2.8%	3.0%	1.9%	2.0%	2.6%	3.6%
Acute liver failure - toxic	0.6%	2.8%	3.9%	4.3%	3.8%	2.6%	2.8%	3.3%
Extrahepatic biliary atresia	6.8%	5.6%	4.4%	4.8%	2.6%	2.2%	2.8%	3.1%
Polycystic disease	0.3%	1.0%	1.2%	1.4%	1.5%	1.8%	2.5%	2.4%
Secondary liver tumors	0.9%	0.6%	0.6%	0.6%	2.2%	1.9%	1.8%	2.1%
Post hepatitis C cirrhosis	0.0%	3.4%	8.2%	9.9%	10.4%	7.9%	2.7%	1.9%
Other liver malignancies	2.5%	2.3%	2.1%	1.5%	1.0%	1.5%	0.9%	1.4%
Post hepatitis B cirrhosis	0.9%	2.7%	3.0%	3.2%	1.5%	1.1%	1.0%	1.2%
Other	18.9%	15.3%	11.4%	10.5%	8.7%	5.3%	5.6%	5.2%

Table 6. Diagnoses of patients listed for a first liver transplantation in 2020 compared with previous years. In 2020 38% of HCC patients listed for a first liver transplantation were anti-HCV positive.

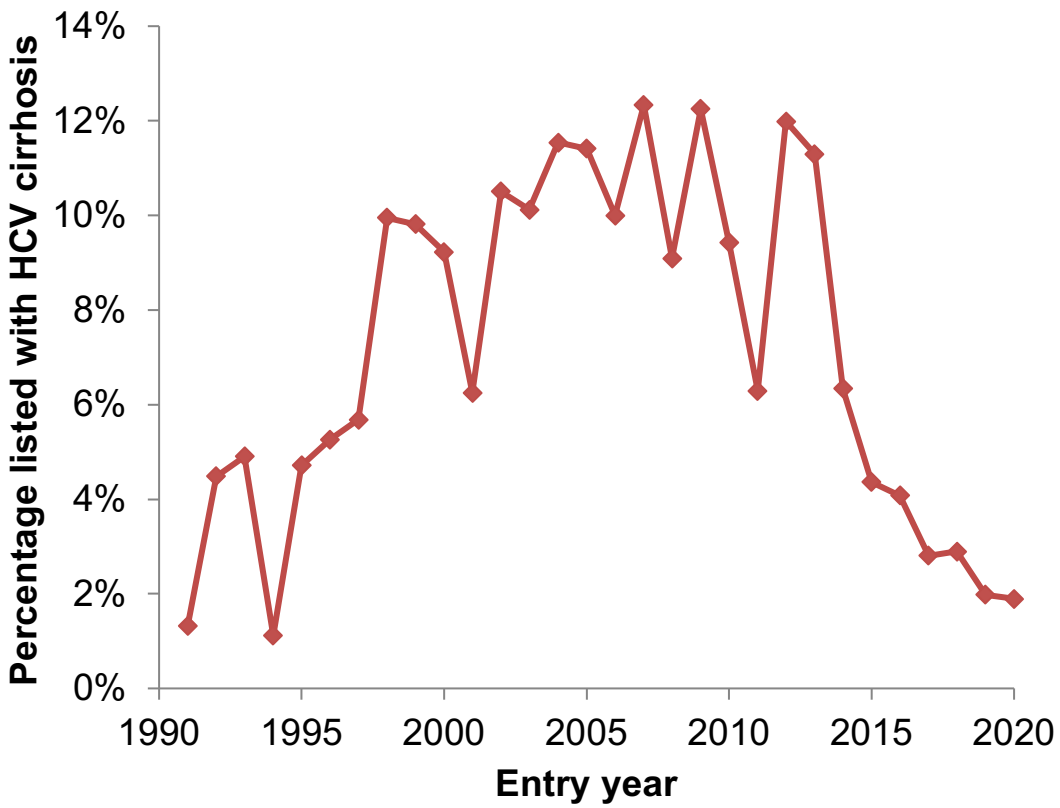

Figure 11. Percentage of patients listed with HCV cirrhosis from 1990-2020.

7. Patient and liver graft survival

When looking at 5-years intervals, patient survival (defined as time from the first liver transplantation until death) and graft survival (defined as time from the first liver transplantation until death or re-transplantation) were dramatically improving over the first years of the Nordic liver transplantation programs (Figures 12 and 13). For the two last 5-year periods the survival is quite similar. There are notable differences in the long-term patient and graft survival for different indications for transplantation (Figures 14, 15 and Table 7). The survival following retransplantation is reduced compared to the primary transplantation, this is particularly evident during the first months after the transplantation (Figure 16). Similar to the survival following the primary transplantation, the survival following retransplantation is markedly better in the recent time-periods

compared to the start of the program. In an intention-to-treat analysis analysing survival from the listing for transplantation, the survival is lower but encompasses all events following listing and gives an indication of the performance of the program (Figure 17).

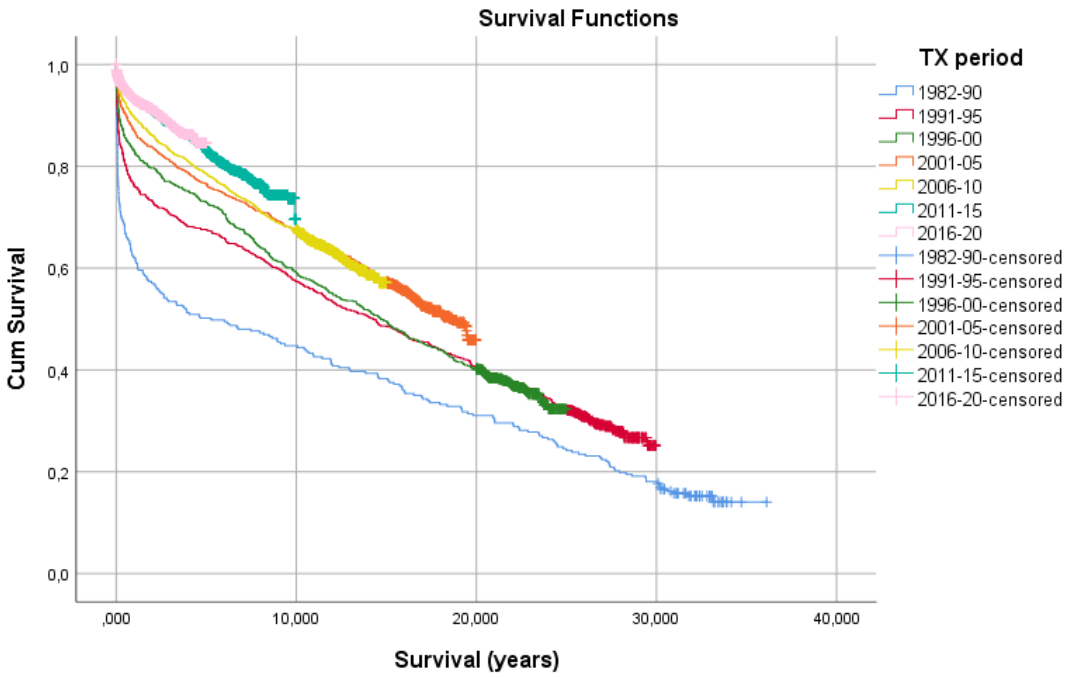

Figure 12. Kaplan-Meier patient survival curve for patients receiving a first liver allograft in the indicated time periods.

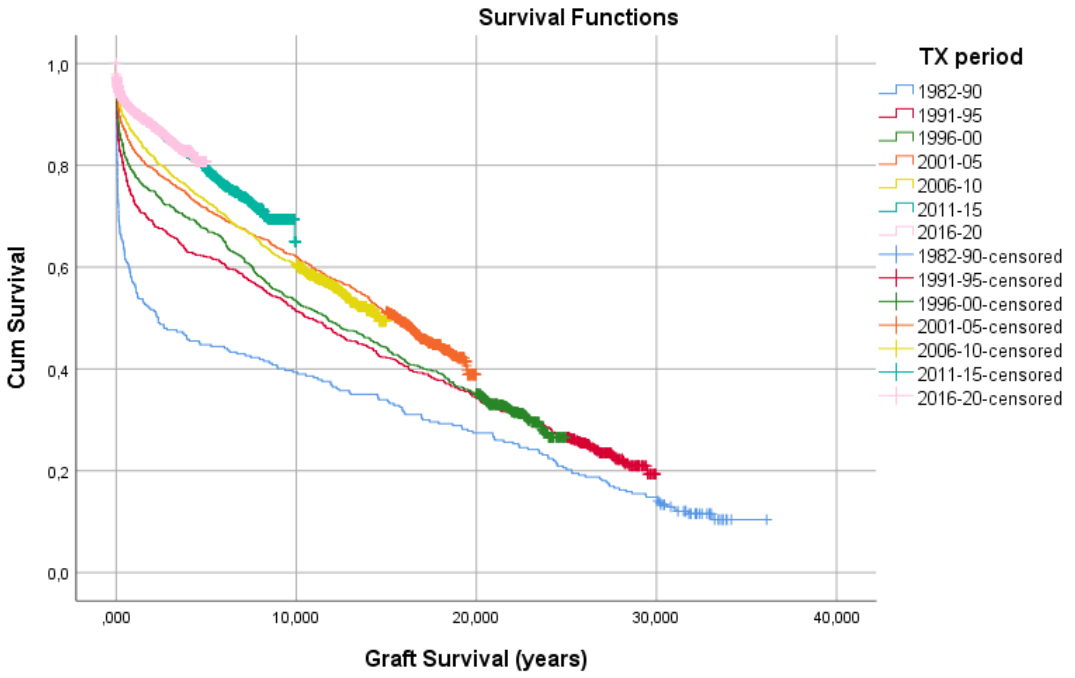

Figure 13. Kaplan-Meier graft survival curve for patients receiving a first liver allograft in the indicated time periods.

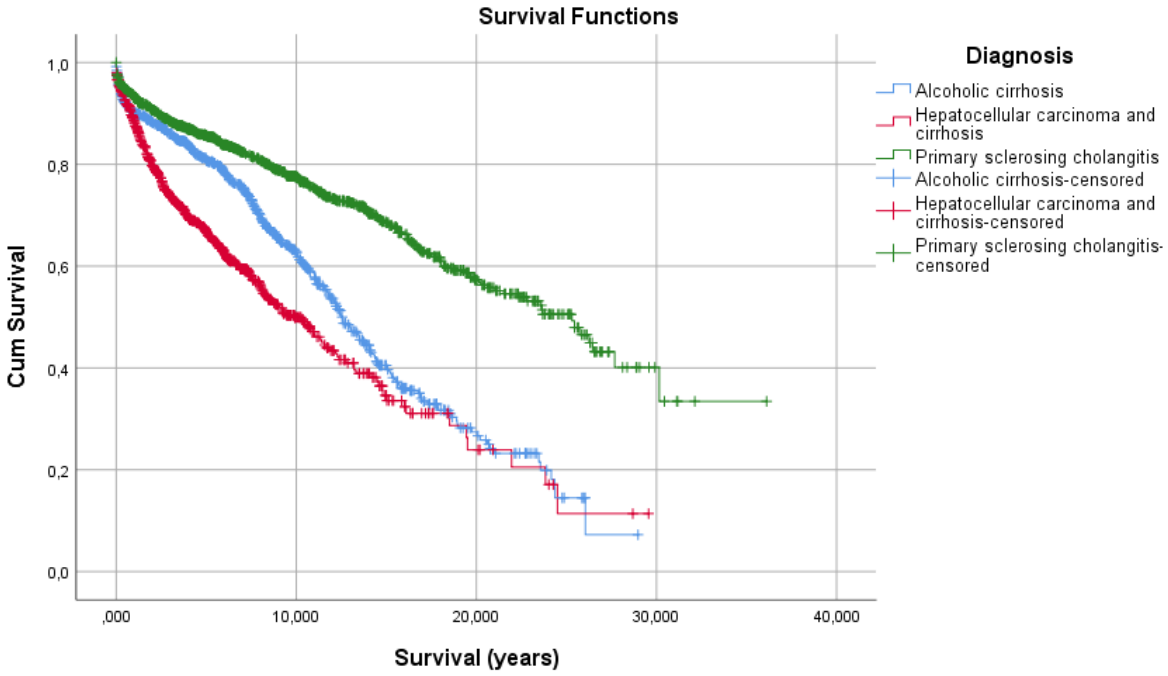

Figure 14. Kaplan-Meier patient survival curve for patients receiving a first liver allograft stratified for the three most common primary diagnoses.

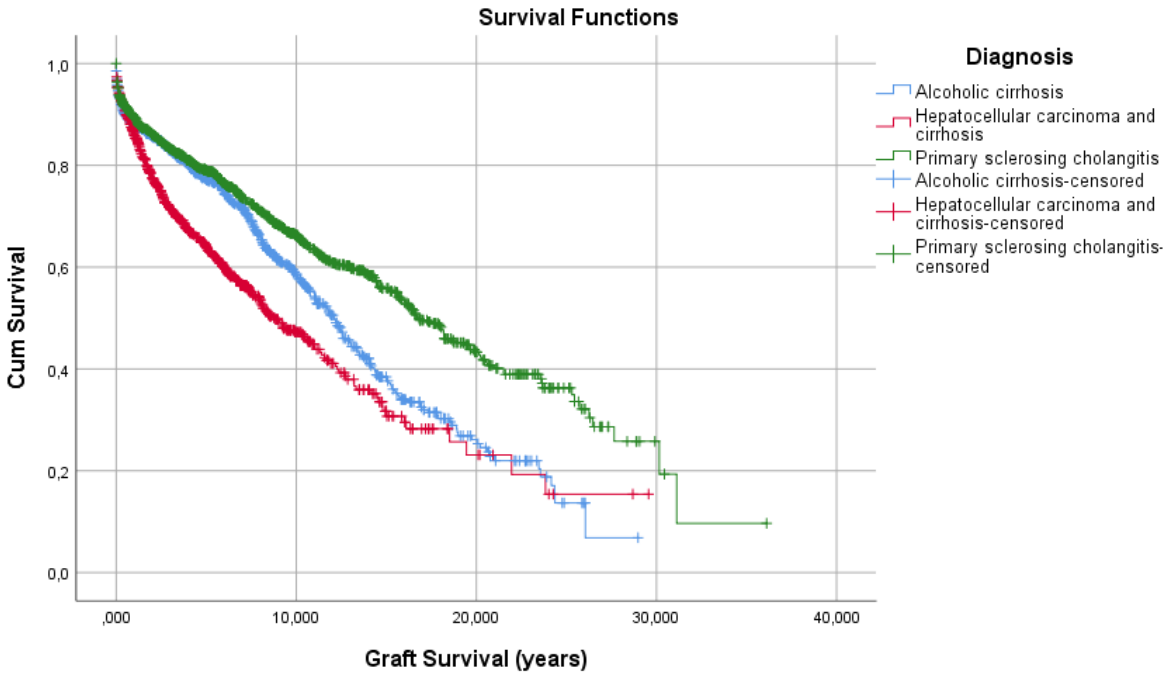

Figure 15. Kaplan-Meier graft survival curve for patients receiving a first liver allograft stratified for the three most common primary diagnoses.

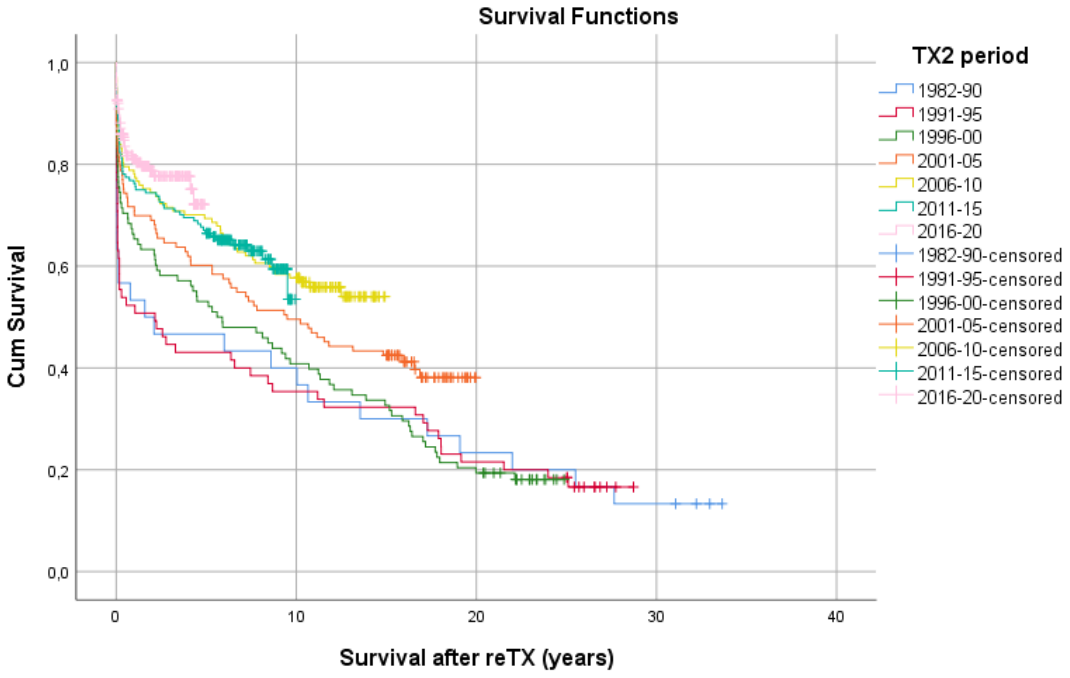

Figure 16. Kaplan-Meier patient survival curve for patients following retransplantation in the indicated time periods.

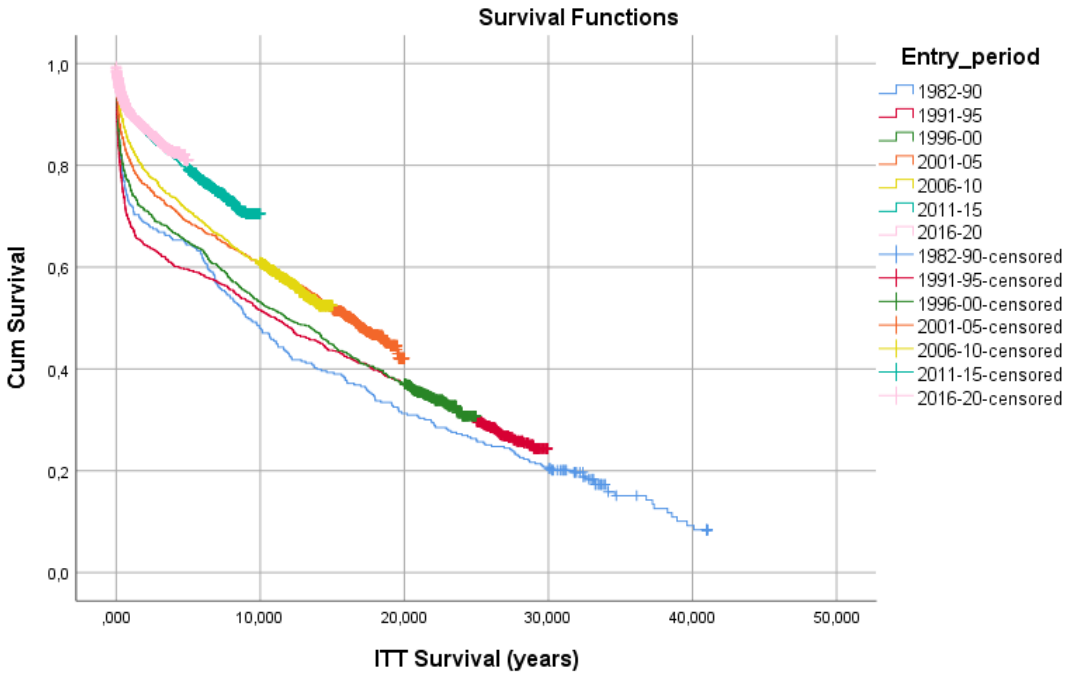

Figure 17. Kaplan-Meier patient intention-to-treat survival curve following listing for transplantation.

	Median age	1-year survival (%)	5-year survival (%)
Primary sclerosing cholangitis	44.9	98 %	90 %
Hepatocellular carcinoma and cirrhosis	61.3	95 %	77 %
Alcoholic cirrhosis	57.4	94 %	85 %
Metabolic disease	51.5	95 %	92 %
Cirrhosis - unknown	56.0	92 %	84 %
Autoimmune cirrhosis	49.7	94 %	88 %
Primary biliary cholangitis	56.5	93 %	89 %
Extrahepatic biliary atresia	1.3	92 %	89 %
Polycystic disease	53.5	97 %	96 %
Post hepatitis C cirrhosis	54.2	90 %	75 %
Listed as highly urgent	42.6	83 %	79 %

Table 7. *Age at transplant and survival for the patients listed 2011-2020 for the ten most common diagnoses and those listed as highly urgent*

8. Maintenance of the registry

There are differences between each center in terms of how extensively data are entered into the NLTR. Diagnosis information, waiting list/transplantation status and survival data for all patients are now complete for 2020. I am extremely grateful for dedicated follow-up provided by the transplant coordinators upon my requests during quality control. In Oslo, I particularly want to thank Monika Olofsson, in Gothenburg Ulla Nyström, in Stockholm Marie Tranäng, in Copenhagen Mette Gottlieb, in Helsinki Leena Toivonen and in Tartu Virge Pall takes care of the registry. The work with the registry was not impacted by the ongoing COVID-19 pandemic. Quality control of the content of NLTR is a continuous priority, and a particular emphasis is put into ensuring integrity of the survival data, including cause of death. The remainder of the registry must be maintained at a level set at the discretion of each individual center and contact person. The export of data from NLTR to ELTR has now been functional for two years and has reduced the burden with dual data collection at all the centers.

9. Acknowledgements - financial support

The NLTR received no financial support in 2020. The maintenance of the Oracle system has been performed by Scandiatransplant. We are extremely grateful for the help and support from Ilse Duus Weinreich and the rest of the Scandiatransplant team in Aarhus. Without their assistance, it would very simply not have been possible to maintain the registry and I sincerely hope their efforts are recognized by the NLTG and Scandiatransplant.

10. Organization and data ownership

The registry (software) is the property of Scandiatransplant. The data in the registry are the property of the hospitals represented in the Nordic Liver Transplantation Group. Utilization of data in research projects should be censored by the latter and need to comply with national guidelines for research ethics and data handling. Co-authorships for publications from research projects should be allocated according to the Vancouver guidelines, this includes presentations of data at conferences. The quality statistics of the transplantation activity presented in this report must not be used in other contexts without permission from the Nordic Liver Transplantation Group.

11. Publications based on the NLTR

Full length articles 1990-2020:

1. Keiding S, Ericzon BG, Eriksson S, Flatmark A, Hockerstedt K, Isoniemi H, Karlberg I, Keiding N, Olsson R, Samela K, Schrumpf E. Survival after liver transplantation of patients with primary biliary cirrhosis in the Nordic countries. Comparison with expected survival in another series of transplantations and in an international trial of medical treatment. Scand J Gastroenterol 1990; 25:11-8

2. Hockerstedt K, Ericzon BG, Eriksson LS, Flatmark A, Isoniemi H, Karlberg I, Keiding N, Keiding S, Olsson R, Samela K. Survival after liver transplantation for primary biliary cirrhosis: use of prognostic indices for comparison with medical treatment. Transpl Proc 1990; 22:1499-500

3. Hockerstedt K, Isoniemi H, Ericzon BG, Broome U, Friman S, Persson H, Bergan A, Schrumpf E, Kirkegaard P, Hjortrup A. Is a 3-day waiting list appropriate for patients with acute liver failure?

Transpl Proc 1994;26:1786-7 4. Bjøro K, Friman S, Höckerstedt K, Kirkegaard P, Keiding S, Schrumpf E, Olausson M, Oksanen A, Isoniemi H, Hjortrup A, Bergan A, Ericzon BG. Liver transplantation in the Nordic countries, 1982-1998: Changes of indications and improving results. Scand J Gastroenterol 1999;34:714-722

5. Bjøro K, Höckerstedt K, Ericzon BG, Friman S, Hjortrup A, Keiding S, Schrumpf E, Duraj F, Olausson M, Mäkisalo H, Bergan A, Kirkegard P. Liver transplantation in patients over 60 years of age. Transpl Int 2000; 13, 165-170 6. Bjøro K, Kirkegaard P, Ericzon BG, Friman S, Schrumpf E, Isoniemi H, Herlenius G, Olausson M, Rasmussen A, Foss A, Höckerstedt K. Is a 3-day limit for highly urgent liver transplantation for fulminant hepatic failure appropriate – or is the diagnosis in some cases incorrect? Transpl Proceed 2001;33:2511-3

7. Ericzon BG, Bjøro K, Höckerstedt K, Hansen B, Olausson M, Isoniemi H, Kirkegaard P, Broome U, Foss A, Friman S. Time to request AB0-identity when transplanting for fulminant hepatic failure? Transpl Proc 2001;33:3466-7 8. Leidenius M, Broome U, Ericzon B-E, Friman S, Olausson M, Schrumpf E, Höckerstedt K. Hepatobiliary carcinoma in primary sclerosing cholangitis: a case control study. J Hepatol 2001;34:792-8.

9. Olausson M, Mjornstedt L, Backman L, Lindner P, Olsson R, Krantz M, Karlsen KL, Stenqvist O, Henriksson BA, Friman S. Liver transplantation--from experiment to routine care. Experiences from the first 500 liver transplantations in Gothenburg. Lakartidningen 2001;98:4556-62

10. Brandsæter B , K Höckerstedt, BG Ericzon, S Friman, P Kirkegaard, H Isoniemi, Foss A, Olausson M, Hansen B, Bjøro K: Outcome following listing for liver transplantation due to fulminant hepatic failure in the Nordic countries. Liver Transplantation 2002;8:1055-62

11. Bjøro K, Ericzon BG, Kirkegaard P, Höckerstedt K, Söderdahl G, Olausson M, Foss A, Schmidt LE, Brandsæter B, Friman S. Liver transplantation for fulminant hepatic failure: impact of donor-recipient ABO-matching on the outcome. Transplantation 2003; 75:347-53

12. Brandsæter Bjørn, Broomé Ulrika, Isoniemi Helena, Friman Styrbjörn, Hansen Bent, Schrumpf Erik, Oksanen Antti, Ericzon Bo-Göran, Höckerstedt Krister, Mäkisalo Heikki, Olsson Rolf, Olausson Michael, Kirkegaard Preben, Bjøro Kristian. Liver transplantation for primary sclerosing cholangitis in the Nordic countries: outcome after acceptance to the waiting list. Liver Transpl. 2003;9:961-9.

13. Brandsaeter B, Friman S, Broome U, Isoniemi H, Olausson M, Backman L, Hansen B, Schrumpf E, Oksanen A, Ericzon BG, Hockerstedt K, Makisalo H, Kirkegaard P, Bjoro K.Outcome following liver transplantation for primary sclerosing cholangitis in the Nordic countries. Scand J Gastroenterol. 2003;38:1176-83.

14. Brandsaeter B, Isoniemi H, Broome U, Olausson M, Backman L, Hansen B, Schrumpf E, Oksanen A, Ericzon BG, Hockerstedt K, Makisalo H, Kirkegaard P, Friman S, Bjoro K. Liver transplantation for primary sclerosing cholangitis; predictors and consequences of hepatobiliary malignancy. J Hepatol. 2004;40:815-822.

15. Bjøro K, Schrumpf E. Liver transplantation for primary sclerosing cholangitis. J Hepatol. 2004;40:570-7.

16. Brandsaeter B, Isoniemi H, Broomé U, Olauson M, Bäckmann L, Hansen B, Oksanen A, Ericzon BG, Höckerstedt K, Mäkisalo H, Kirkegaard P, Friman S, Bjøro K, Schrumpf E (Nordic Liver Transplantation Group). Chemopreventive effect of ursodeoxycholicacid in primary sclerosing cholangitis? Falk Symposium 141. Bile Acid Biology and its Therapeutic Implications. XVIII International Bile Acid Meeting 2005;242-249.

17. Melum E, Schrumpf E, Bjøro K. Liver TX for hepatitis C

cirrhosis in a low prevalence population: risk factors and status at evaluation. Scand J Gastroenterol. 2006;41:592-6.

18. Bjøro K, Brandsaeter B, Foss A, Schrumpf E. Liver transplantation in primary sclerosing cholangitis. Semin Liver Dis. 2006;26:69-79.

19. Melum E, Friman S, Bjøro K, Rasmussen A, Isoniemi H, Gjertsen H, Bäckman L, Oksanen A, Olausson M, Duraj FF, Ericzon BG. Hepatitis C impairs survival following liver transplantation irrespective of concomitant hepatocellular carcinoma. J Hepatol. 2007;47:777-83.

20. Friman S, Foss A, Isoniemi H, Olausson M, Höckerstedt K, Yamamoto S, Karlsen TH, Rizell M, Ericzon BG. Liver transplantation for cholangiocarcinoma: selection is essential for acceptable results. Scand J Gastroenterol. 2011;46:370-5.

21. Jørgensen KK, Lindström L, Cvancarova M, Castedal M, Friman S, Schrumpf E, Foss A, Isoniemi H, Nordin A, Holte K, Rasmussen A, Bergquist A, Vatn MH, Boberg KM. Colorectal neoplasia in patients with primary sclerosing cholangitis undergoing liver transplantation: a Nordic multicenter study. Scand J Gastroenterol. 2012;47:1021-9.

22. Jørgensen KK, Lindström L, Cvancarova M, Karlsen TH, Castedal M, Friman S, Schrumpf E, Foss A, Isoniemi H, Nordin A, Holte K, Rasmussen A, Bergquist A, Vatn MH, Boberg KM. Immunosuppression after liver transplantation for primary sclerosing cholangitis influences activity of inflammatory bowel disease. Clin Gastroenterol Hepatol. 2013;11:517-23

23. Fosby B, Melum E, Bjøro K, Bennet W, Rasmussen A, Andersen IM, Castedal M, Olausson M, Wibeck C, Gotlieb M, Gjertsen H, Toivonen L, Foss S, Makisalo H, Nordin A, Sanengen T, Bergquist A, Larsson ME, Soderdahl G, Nowak G, Boberg KM, Isoniemi H, Keiding S, Foss A, Line PD, Friman S, Schrumpf E, Ericzon BG,

Höckerstedt K, Karlsen TH. Liver transplantation in the Nordic countries - An intention to treat and post-transplant analysis from The Nordic Liver Transplant Registry 1982-2013. Scand J Gastroenterol. 2015;50:797-808.

24. Thorsen T, Aandahl EM, Bennet W, Olausson M, Ericzon BG, Nowak G, Duraj F, Isoniemi H, Rasmussen A, Karlsen TH, Foss A. Transplantation With Livers From Deceased Donors Older Than 75 Years. Transplantation. 2015;99:2534-42

25. Åberg F, Gissler M, Karlsen TH, Ericzon BG, Foss A, Rasmussen A, Bennet W, Olausson M, Line PD, Nordin A, Bergquist A, Boberg KM, Castedal M, Pedersen CR, Isoniemi H. Hepatology. 2015;61:668-77

26. Malenicka S, Ericzon BG, Jørgensen MH, Isoniemi H, Karlsen TH, Krantz M, Naeser V, Olausson M, Rasmussen A, Rönnholm K, Sanengen T, Scholz T, Fischler B, Nemeth A. Impaired intention-to-treat survival after listing for liver transplantation in children with biliary atresia compared to other chronic liver diseases: 20 years' experience from the Nordic countries.
Pediatr Transplant. 2017 Mar;21(2). doi: 10.1111/petr.12851

27. Åberg F, Isoniemi H, Pukkala E, Jalanko H, Rasmussen A, Storm HH, Schultz N, Bennet W, Ekvall N, Ericzon BG, Malenicka S, Tretli S, Line PD, Boberg KM, Østensen A, Karlsen TH, Nordin A.
Cancer After Liver Transplantation in Children and Young Adults: A Population-Based Study From 4 Nordic Countries.
Liver Transpl. 2018 Sep;24(9):1252-1259. doi: 10.1002/lt.25305.

28. Holmer M, Melum E, Isoniemi H, Ericzon BG, Castedal M, Nordin A, Aagaard Schultz N, Rasmussen A, Line PD, Stål P, Bennet W, Hagström H.
Nonalcoholic fatty liver disease is an increasing indication for liver transplantation in the Nordic countries.

Liver Int. 2018 Nov;38(11):2082-2090. doi: 10.1111/liv.13751. Epub 2018 May 2.

29. Nordin A, Åberg F, Pukkala E, Pedersen CR, Storm HH, Rasmussen A, Bennet W, Olausson M, Wilczek H, Ericzon BG, Tretli S, Line PD, Karlsen TH, Boberg KM, Isoniemi H.
Decreasing incidence of cancer after liver transplantation-A Nordic population-based study over 3 decades.
Am J Transplant. 2018 Apr;18(4):952-963. doi: 10.1111/ajt.14507. Epub 2017 Oct 17.

30. Lindström L, Jørgensen KK, Boberg KM, Castedal M, Rasmussen A, Rostved AA, Isoniemi H, Bottai M, Bergquist A.
Risk factors and prognosis for recurrent primary sclerosing cholangitis after liver transplantation: a Nordic Multicentre Study.
Scand J Gastroenterol. 2018 Mar;53(3):297-304. doi: 10.1080/00365521.2017.1421705. Epub 2018 Jan 4.

31. Tschuor C, Ferrarese A, Kuemmerli C, Dutkowski P, Burra P, Clavien PA; Liver Allocation Study Group.
Allocation of liver grafts worldwide - Is there a best system?
J Hepatol. 2019 Oct;71(4):707-718. doi: 10.1016/j.jhep.2019.05.025.

32. Schult A, Stokkeland K, Ericzon BG, Hultcrantz R, Franck J, Stål P, Castedal M.
Alcohol and drug use prior to liver transplantation: more common than expected in patients with non-alcoholic liver disease.
Scand J Gastroenterol. 2019 Sep;54(9):1146-1154. doi: 10.1080/00365521.2019.1656772.