The Nordic Liver Transplant Registry (NLTR)

Annual report 2024

Report prepared by Lise Katrine Engesæter June 2025

Responsible contact persons:

Scandiatransplant Denmark - Århus; Ilse Duus Weinreich

Denmark - Copenhagen; Allan Rasmussen

Sweden - Gothenburg; William Bennet

Sweden - Stockholm; Carl Jorns

Finland - Helsinki; Arno Nordin

Norway - Oslo; Morten Hagness

Estonia - Tartu; Virge Pall

NLTR; Lise Katrine Engesæter likeng@ous-hf.no

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 March 2025. 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 2024

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 2024, data from a total of 10469 patients had been entered into NLTR. Of these, 9255 patients had received a first liver graft, 939 (10.2%) had been transplanted more than once, and 139 (1.5%) had been transplanted more than twice. A total of 220 living donor transplantations had been performed. Children below 18 years constituted 965 (9.2%) of the transplanted patients in the registry.

3. Transplantation activity 2024

The total number of patients who received a first liver graft in 2024 was 371 (Figure 1). Of these, 14 were combined liver-kidney transplantations. Three were multivisceral and these transplantations were all performed in Gothenburg. Of the first liver transplantations performed in 2024, 5 was a living donor transplantation and none was a domino transplantation. The living donor transplantations were all performed in Oslo. Fourtyseven patients received a DCD graft. In addition, 33 re-transplantations were performed (Table 2). The total number of liver transplantations was 404, which represents a slight decrease from last year`s record high figures.

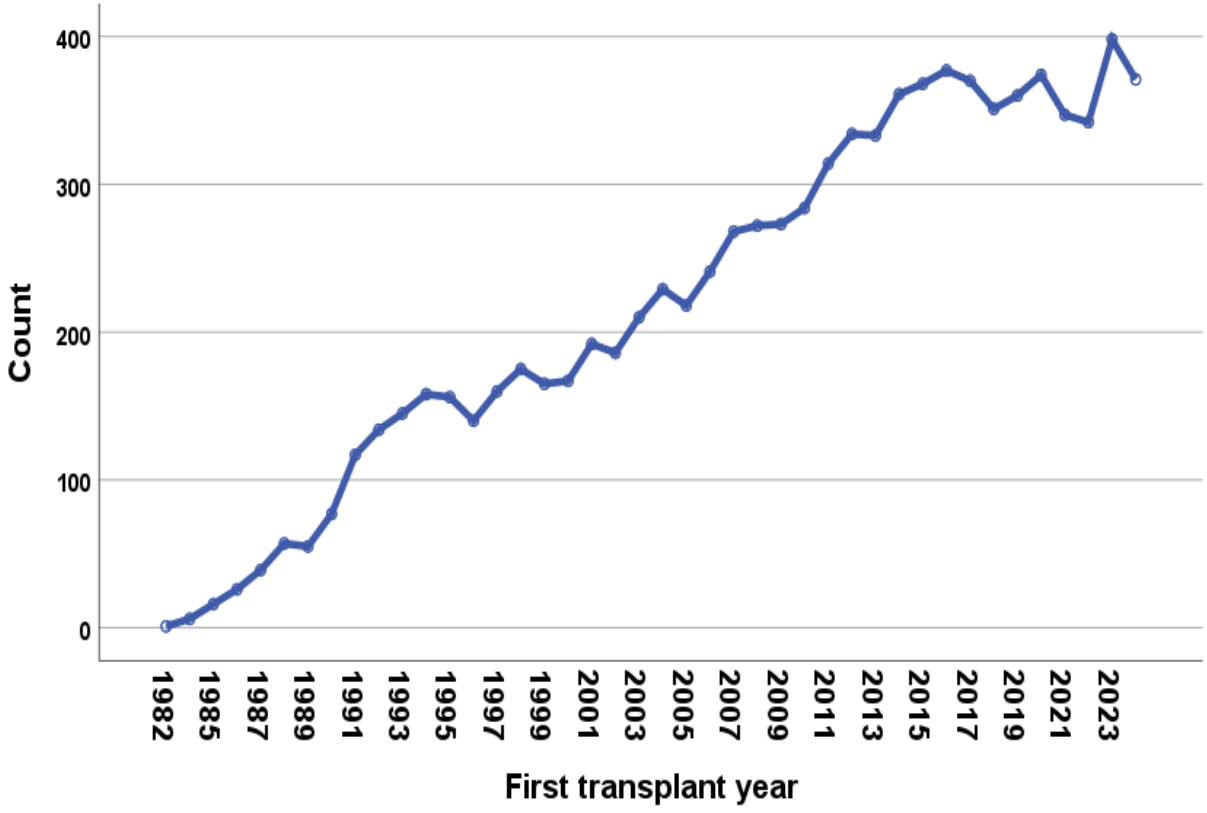

Figure 1. Annual number of first liver transplants 1982-2024.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Copenhagen	41	55	51	52	39	61	59	45	41	61	52
Gothenburg	89	86	88	84	83	80	73	87	80	89	89
Helsinki	56	70	54	57	60	56	71	65	55	69	68
Oslo	89	72	88	85	87	75	76	83	89	83	78
Stockholm	77	79	86	82	73	78	84	63	68	82	74
Tartu	9	6	10	10	9	10	11	4	9	14	10

Table 1. Number of first liver transplantations performed at the individual centers during the last 10 years.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Copenhagen	6	3	9	5	4	3	7	5	5	4	6
Gothenburg	8	8	17	10	3	15	8	10	10	10	5
Helsinki	3	7	7	6	6	9	4	10	7	9	8
Oslo	11	14	12	17	8	19	12	15	3	9	5
Stockholm	8	8	7	5	4	9	9	8	7	17	9
Tartu	1	1	0	0	1	0	1	0	0	3	0

Table 2. Total number of re-transplantations performed at the individual centers during the last 10 years.

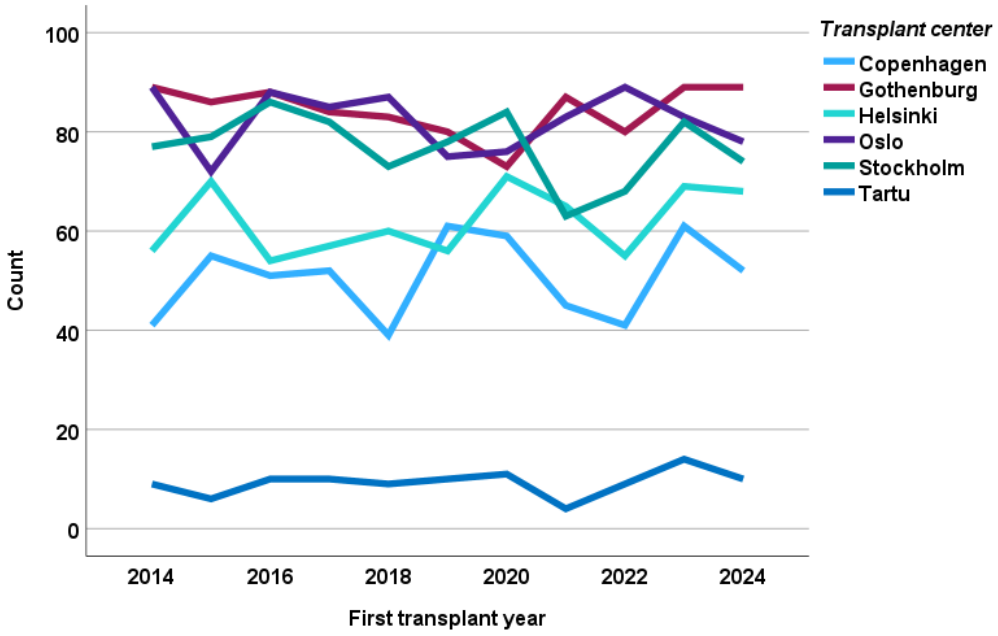

Figure 2. Number of first liver transplantations performed at the Scandiatransplant centers that are currently performing liver transplantations.

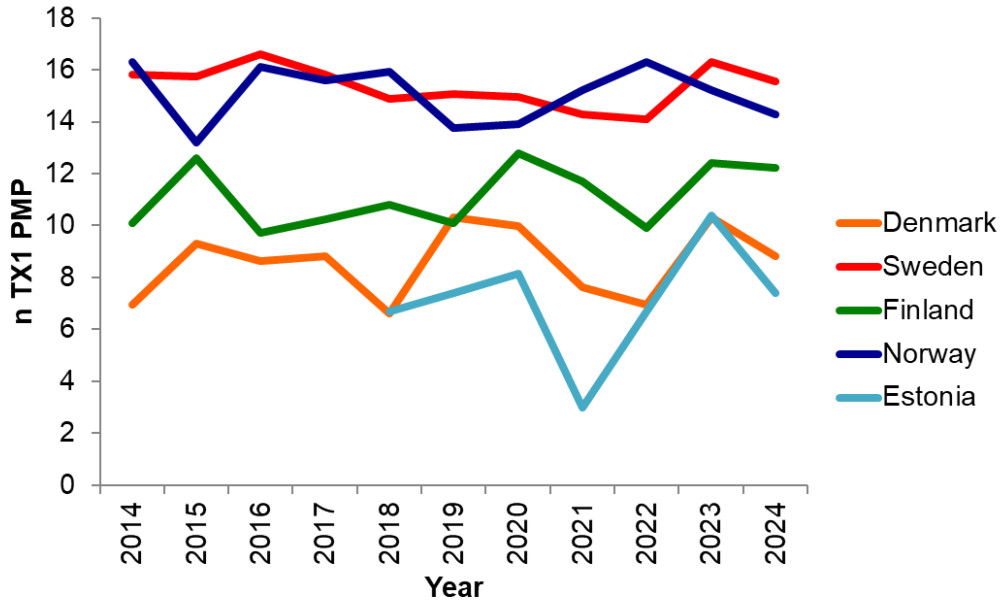

Figure 3. Number of first liver transplantations performed in the Scandiatransplant countries according to the country's population.

PMP, per million population.

4. The waiting list 2024

In 2024, a total of 354 patients were entered on the waiting list for a first liver transplant (Table 3), this is a decrease from the 418 entered in 2023 (Figure 4). Seventeen of the patients listed for a first liver transplant in 2024 were listed as highly urgent. This is a slight decrease from the numbers in 2023, but still higher than 2020, 2021 and 2022 which were markedly decreased compared to previous years.

Active on waiting list	Deceased donor	Living donor	Dead	Permanent withdrawal
72	260	5	7	11

Table 3. Patients entering the waiting list in 2024 classified by outcome as of December 31st 2024.

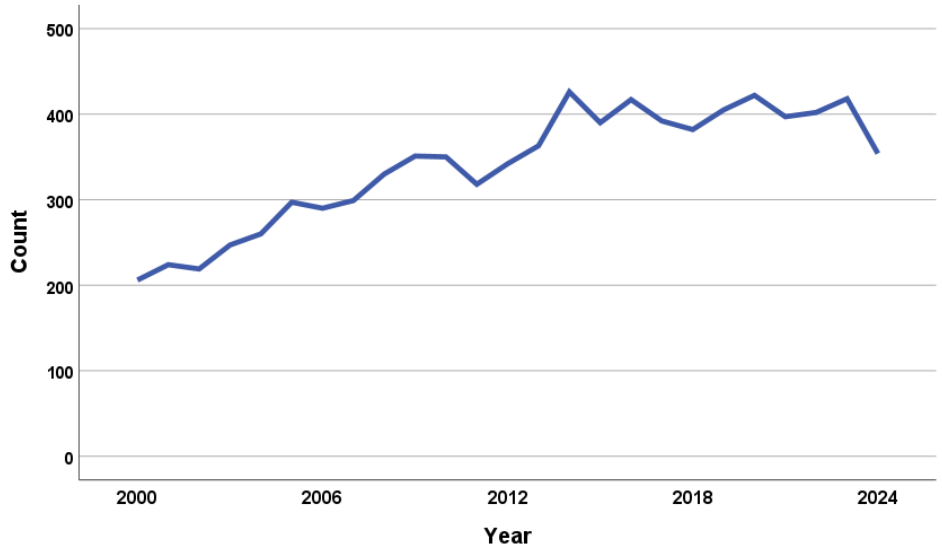

Figure 4. Number of patients entering the waiting list from 2000-2024.

The number of deaths among patients listed in 2024 for a first liver transplant was 7 (Denmark 1, Sweden 2, Finland 2, Norway 1, Estonia 1).

The median waiting time in 2024 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, but with a decrease in waiting time for blood type B after last years marked increase. (Figure 7).

0	A	AB	B
84 (1403)	33 (433)	26 (316)	83 (1419)

Table 4. Median time on waiting list (days) for patients receiving a first liver allograft in 2024 according to ABO blood type. The number in parenthesis represents the maximum waiting time for the indicated blood type in 2024. (Patients listed as highly urgent are excluded from the calculations).

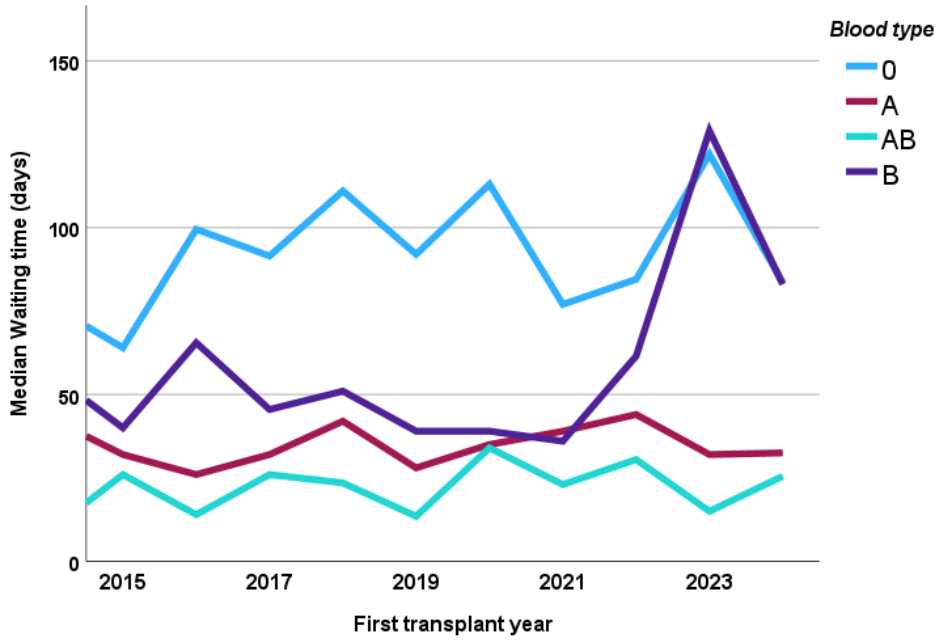

Figure 7. Median waiting time for first liver transplantation according to ABO blood type for 2015-2024. (Patients listed as highly urgent are excluded from the calculations).Tartu had the longest and Stockholm the shortest waiting time in 2024 (Table 5). The waiting times in 2024 went down or were largely stable compared to previous years (Figure 8). The waiting times are still remarkably low compared to other programs.

Copenhagen	Gothenburg	Helsinki	Oslo	Stockholm	Tartu
72 (509)	46 (1419)	52 (349)	84 (881)	33 (433)	125(1125)

Table 5. Median time on waiting list (days) for patients receiving a first liver allograft in 2024 according to transplantation center. The number in parenthesis represents the maximum waiting time for the indicated center in 2024. (Patients listed as highly urgent are excluded from the calculations).

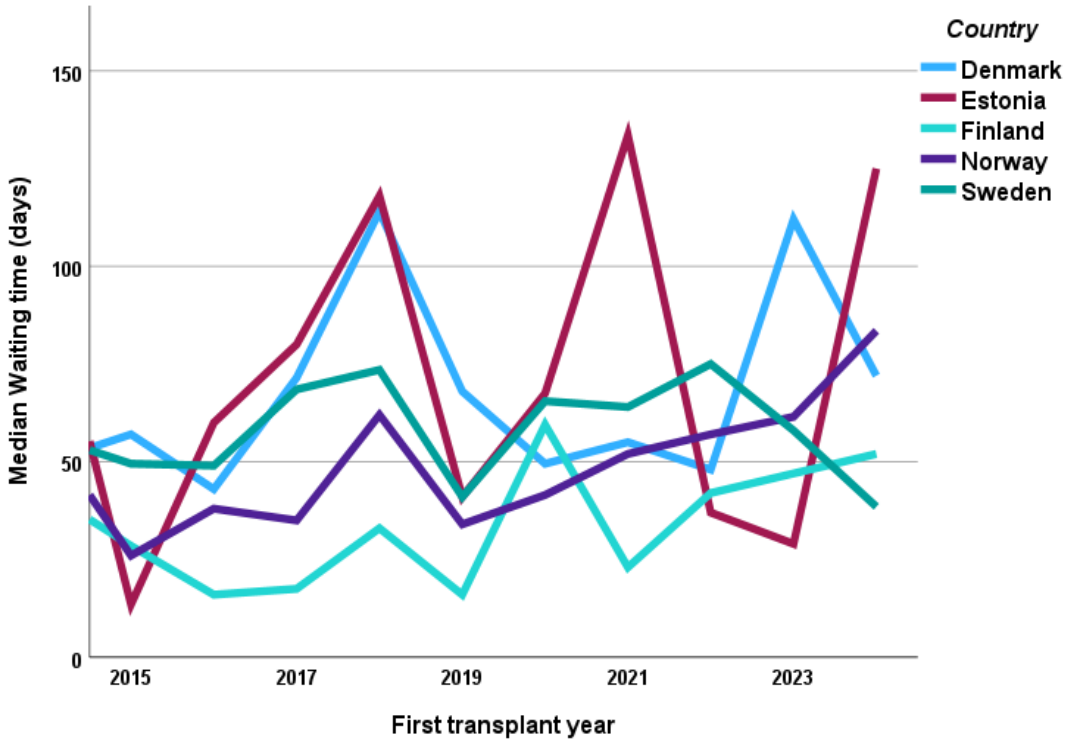

Figure 8. Median waiting time for first liver transplantation according to country for 2015-2024. (Patients listed as highly urgent are excluded from the calculations).

5. Age of recipients and donors

The mean age of adult liver recipients (>18 years, first liver transplantation) in 2024 was 54.5 years. Mean age of children (<18 years, first liver transplantation) in 2024 was 5.0 years. Recipients between 30 and 60 years of age at the first transplantation are still the largest group, but more patients >70 years are transplanted (Figure 9). The median age of the donors has remained stable since 2015 with 51.0 years in 2024 (Figure 10).

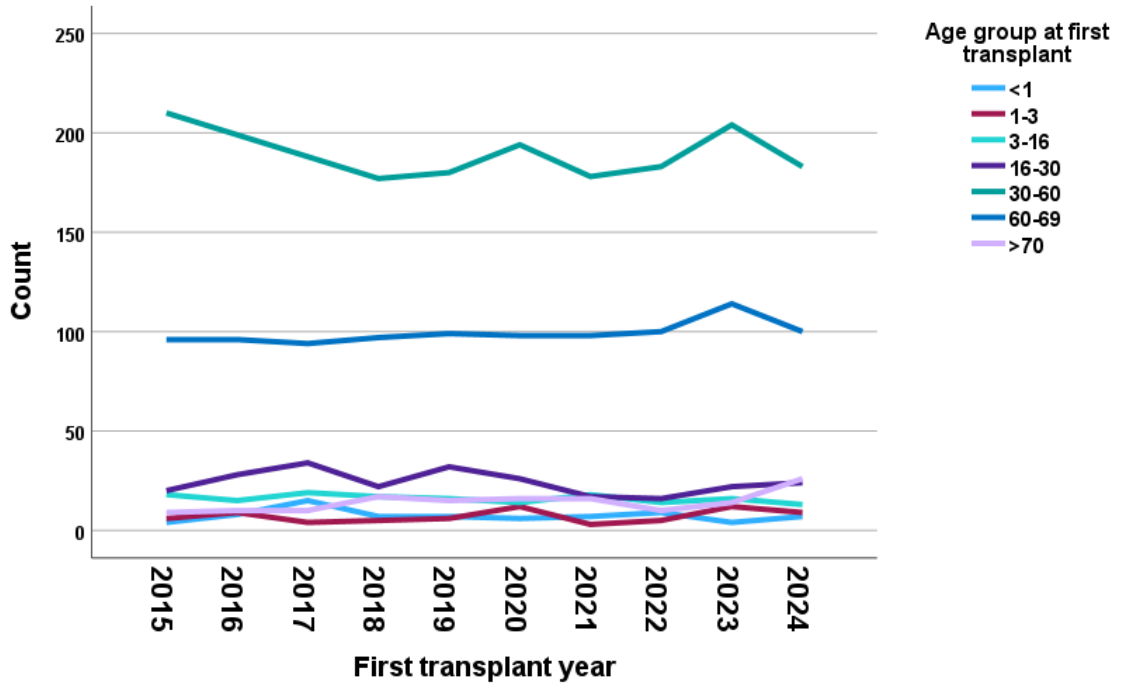

Figure 9. Number of liver transplants in the indicated age groups.

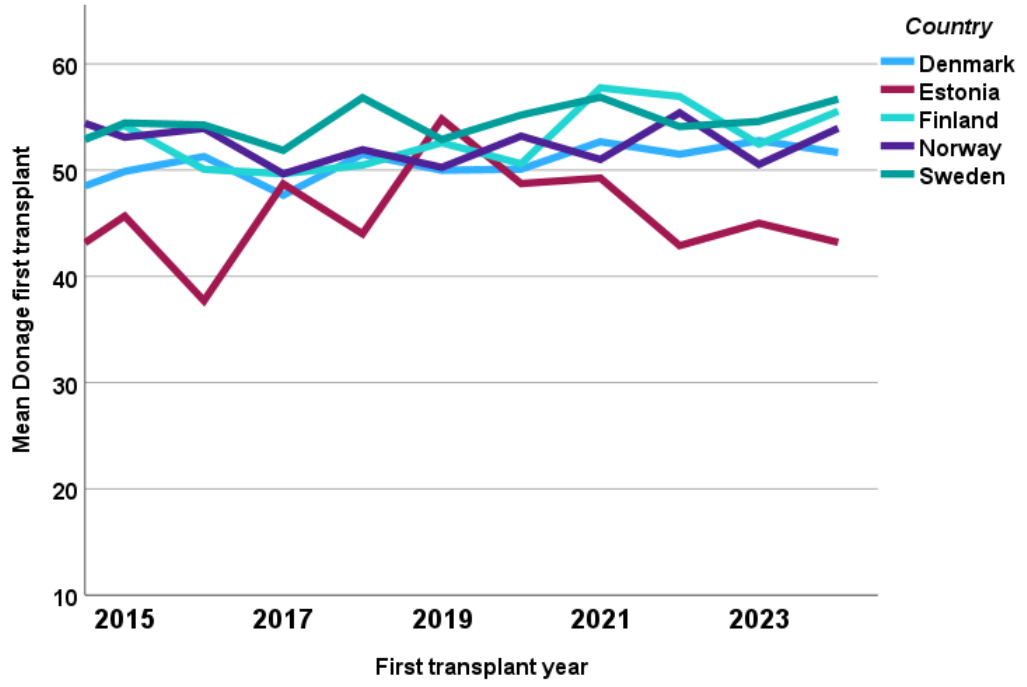

Figure 10. Mean age of donors utilized in the indicated years stratified for the different countries.

6. Diagnoses

In 2024, primary sclerosing cholangitis was again the leading indication for adult liver transplantation in the Nordic countries after being the third most common indication in 2023. (Table 6).

	1982-90	1991-99	2000-09	2010-19	2020-24	2024
Primary sclerosing cholangitis	**13.9 %**	**15.5 %**	**17.3 %**	**18.1 %**	**17.3 %**	**19.2 %**
Hepatocellular carcinoma	**11.2 %**	**5.3 %**	**8.6 %**	**17.7 %**	**16.3 %**	**17.3 %**
Alcohol associated liver disease	**2.4 %**	**11.5 %**	**13.3 %**	**13.8 %**	**16.9 %**	**14.9 %**
Metabolic disease	**5.2 %**	**5.7 %**	**5.5 %**	**7.0 %**	**7.7%**	**10.2 %**
Primary biliary cholangitis	**29.1 %**	**14.1 %**	**7.8 %**	**5.3 %**	**4.7 %**	**5.6 %**
Acute liver failure - other	**9.6 %**	**8.6 %**	**5.6 %**	**5.3 %**	**4.7 %**	**3.1 %**
Secondary liver tumors	**1.2 %**	**0.6 %**	**1.4 %**	**2.0 %**	**2.9 %**	**2.8 %**
Acute liver failure - toxic	**0.8 %**	**3.8 %**	**4.2 %**	**2.8 %**	**2.5 %**	**2.5%**
Other	**26.6%**	**34.9%**	**36,3%**	**28.0%**	**27.0%**	**24.4%**

Table 6. Diagnoses of adult patients listed for a first liver transplantation in 2024 compared with previous time periods.

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 retransplantation) were dramatically improving over the first years of the Nordic liver transplantation programs (Figures 12 and 13). For the last two 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 (Figure 17)

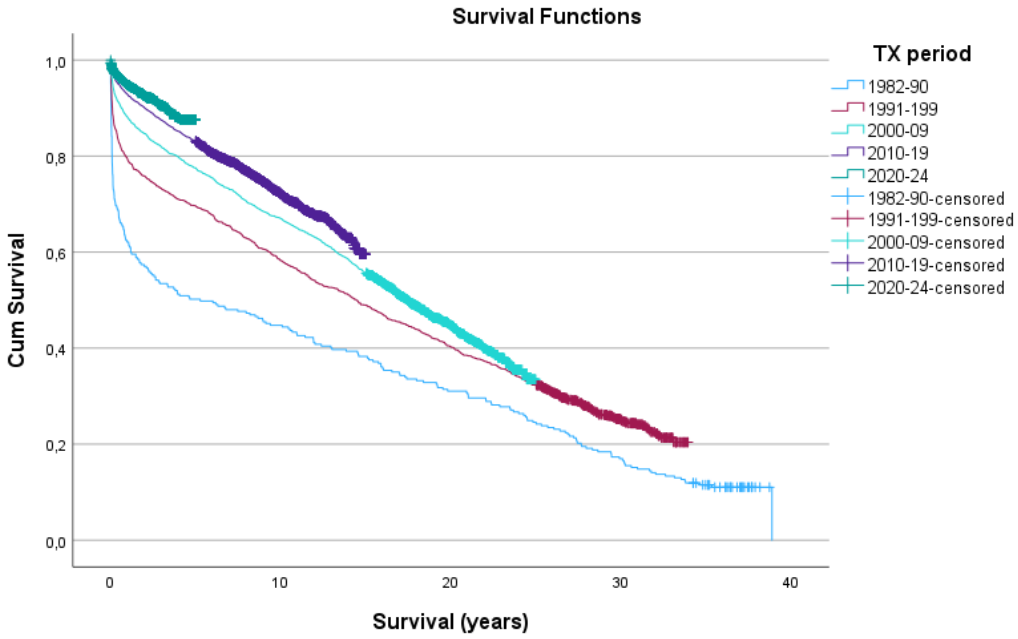

Figure 12. Kaplan-Meier patient survival curve for patients receiving a first liver allograft in the indicated time periods.

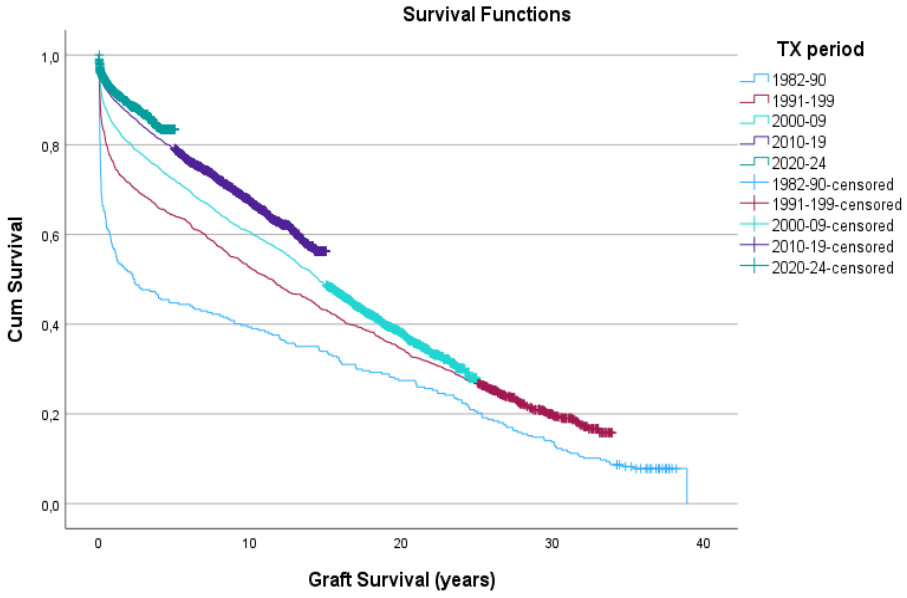

Figure 13. Kaplan-Meier graft survival curve for patients receiving a first liver allograft in the indicated time periods.

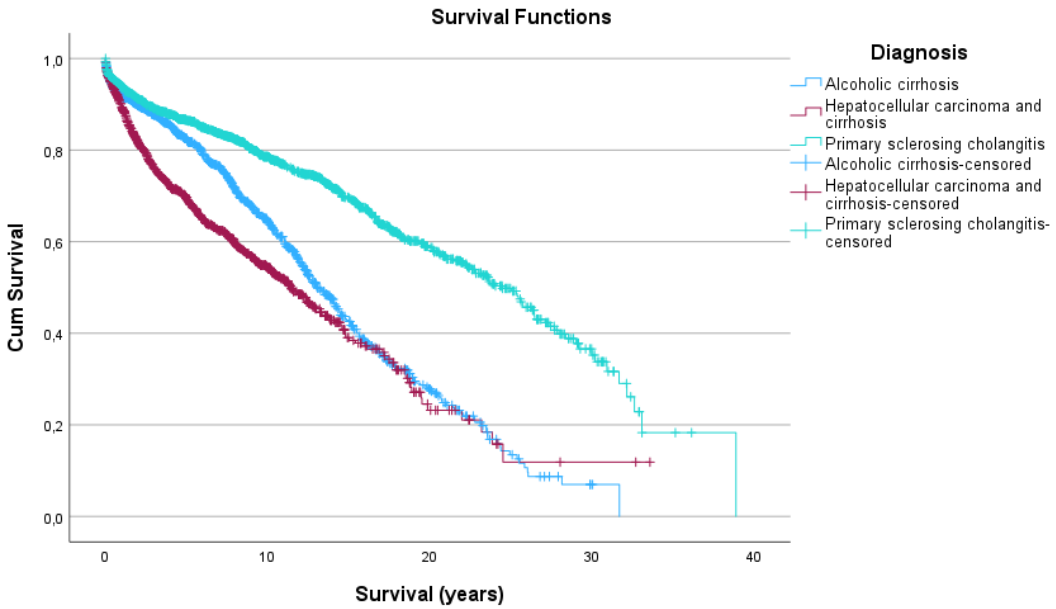

Figure 14. Kaplan-Meier patient survival curve for patients receiving a first liver allograft stratified for the three most common primary diagnoses.

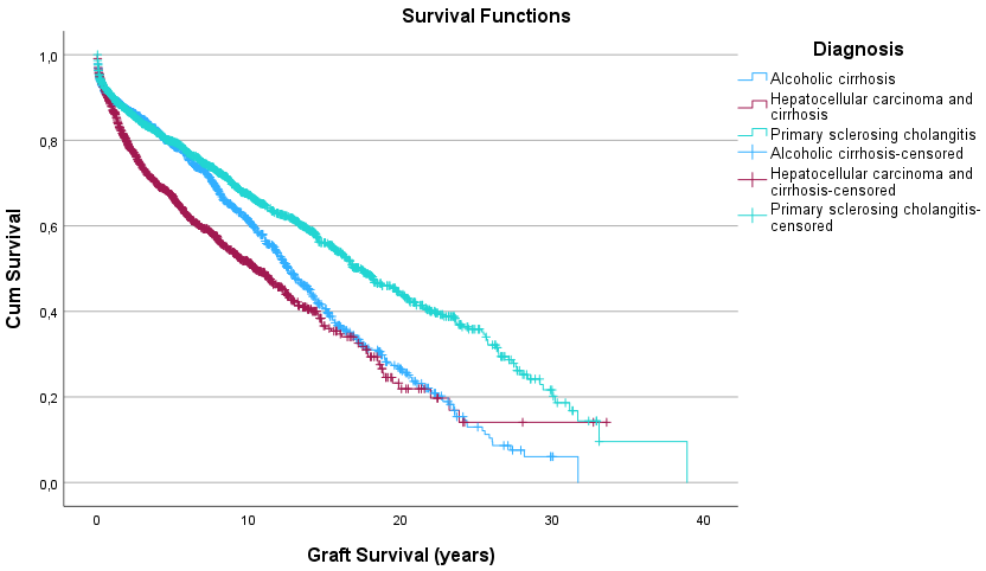

Figure 15 Kaplan-Meier graft survival curve for patients receiving a first liver allograft stratified for the three most common primary diagnoses

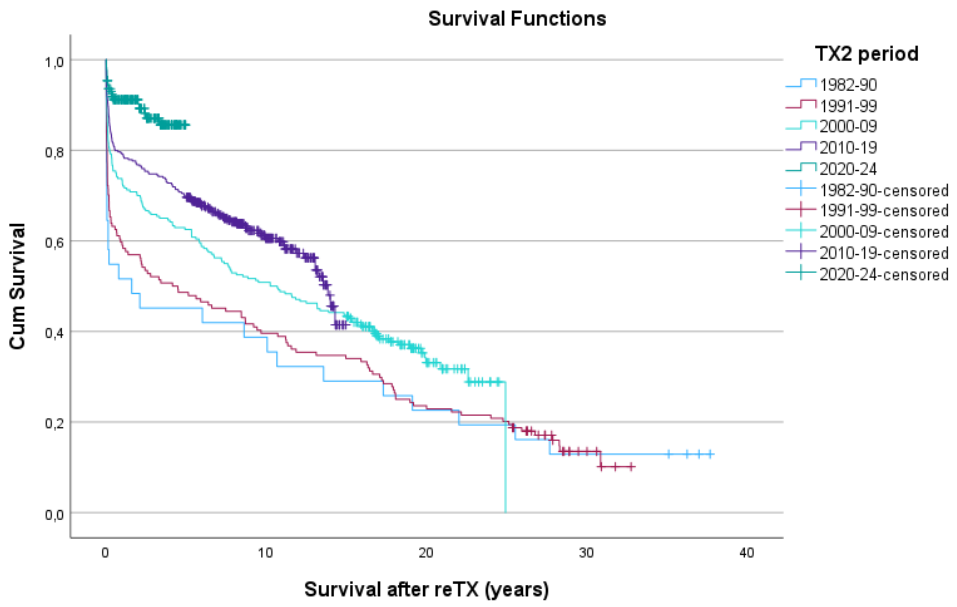

Figure 16. Kaplan-Meier patient survival curve for patients following retransplantation in the indicated time periods.

	Median age	1-year survival (%)	5-year survival (%)
Primary sclerosing cholangitis	45.1	98 %	91 %
Hepatocellular carcinoma and cirrhosis	62.7	94 %	78 %
Alcohol related liver disease	58.3	96 %	85 %
Metabolic disease	52.3	96 %	86 %
Cirrhosis - unknown	57.0	92 %	87 %
Autoimmune cirrhosis	50.2	96 %	86 %
Primary biliary cholangitis	56.7	93 %	90 %
Extrahepatic biliary atresia	1.5	94 %	94 %
Polycystic disease	56.2	96 %	96 %
Post hepatitis C cirrhosis	57.1	87 %	78 %
Listed as highly urgent	41.8	84 %	81 %

Table 7. Age at transplant and survival for the patients listed 2014-2024 for ten selected diagnoses and those listed as highly urgent.

8. Maintenance of the registry

There are differences between each center in terms of how extensive data are entered into the NLTR. Diagnosis information, waiting list/transplantation status and survival data for all patients are now complete for 2024. We are extremely grateful for the dedicated follow-up provided by the transplant coordinators upon our requests during quality control. In Oslo, we particularly want to thank Monika Olofsson and Hanna Klevengen, in Gothenburg Ulrika Samuelsson, in Stockholm Malin Aram and Marie Tranäng, in Copenhagen Ulla Brink Plagborg, in Helsinki Leena Toivonen and in Tartu Virge Pall. 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.

9. Acknowledgements - financial support

The NLTR received no financial support in 2024. The maintenance of the database system has been performed by Scandiatransplant. We are extremely grateful for the help and support from Anne Ørskov Boserup, 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 we 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 1990-2024:

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 3day 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, OlssonR, 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 donorrecipient 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 BoGöran, 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-totreat 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.

33:Bergsmark T, Engesæter LK, Rasmussen A, Bennet W, Nordin A, Pall V, Line PD, Ericzon BG, Melum E. Long-term survival after liver transplantation for alcohol-related liver disease in the Nordic countries. Scand J Gastroenterol. 2023 Jul-Dec;58(8):923-930. doi: 10.1080/00365521.2023.2184193. Epub 2023 Mar 5.

34:Molinaro A, Engesæter LK, Jorns C, Nordin A, Rasmussen A, Line PD, Pall V, Ericzon BG, Bennet W, Hov JR, Melum E. Outcome of Liver Retransplantation in Patients With Primary Sclerosing Cholangitis. Liver Int. 2025 Jan;45(1):e16214. doi: 10.1111/liv.16214. PMID: 39679639; PMCID: PMC11648066.