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Letter to the editor

Life expectancy after liver transplantation for hepatitis C cirrhosis



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Cirrhosis caused by the hepatitis C virus (HCV) remains one of the leading indications for liver transplantation (LT) in the United States. The near-universal reactivation of HCV following transplant previously led to poor survival. Since their introduction in 2013, however, direct-acting antivirals (DAA) have dramatically improved quality of life and survival of individuals with HCV. The short-term improvement is well documented [2,4,5]. We here examine long-term survival, and calculate life expectancies.

The methods used here are the same as those previously described in Shavelle et al. [8]. Briefly, de-identified data from the OPTN database, which includes all organ transplants performed in the United States, was analyzed. We restricted attention to patients meeting three criteria: (1) primary reason for transplant as HCV, (2) age 35 to 74 years, and (3) receiving a first-time liver-only transplant during calendar years 2014 to 2018.

Patient characteristics are given in Supplemental Table 1. The mean age at transplant was 59 years, 70% were male, and 70% were white. Follow-up times ranged from 0 to 5 years (mean 2 years), and there were 404 deaths in 3723 patients over the 2014–2018 period. For comparison, characteristics of patients receiving transplants instead in 2002–2013 are also included in Supplemental Table 1. Supplemental Table 2 shows the survival models that were used to calculate the life expectancies.

Life expectancies are shown in Table 1, arranged by age, sex, and time since transplant, as well as by select risk factors shown to affect survival. For example, a 40-year-old male who recently underwent transplantation for HCV has a life expectancy of 20 additional years, compared with 39 additional years observed in the general population (GP). At age 41, or 1 year post transplantation, the life expectancy is also shown to be 20 years. At age 45, or 5 years into the transplant, his life expectancy would be 18 additional years.

Next, consider another 40-year-old male whose length of hospital stay was greater than 31 days. His life expectancies at transplant, 1 year post, and 5 years post are 11, 12, and 10 years, respectively.

These three values are significantly lower than the GP, and also greatly reduced compared to recipients whose length of hospital stay was shorter. A lengthy hospital stay is not necessarily a modifiable risk factor, but is nonetheless informative regarding prognosis. Other risk factors observed to yield a worse survival outcome are the ongoing history of diabetes, hepatic encephalopathy, and need for dialysis. Comparing life expectancies between males and females, no significant difference was observed after liver transplant, despite the higher GP life expectancy in females. This could be because males and females with HCV have more similar risk factors than men and women in the general population. This pattern has been observed in similar studies [1].

Life expectancy following LT for HCV is comparable to that due to other LT indications. For example, the figures given here are similar to those of patients undergoing LT for NASH [6] and slightly better than that of patients receiving transplants for alcohol-related liver disease [8]. Importantly, survival has improved in recent years. For example, the life expectancy of a 40-year-old male undergoing LT in the current era is 20 additional years, while a 40-year-old male receiving a transplant in the period of 2002–2013 would have life expectancy of 17 years (results not shown). This is consistent with improvements in survival documented elsewhere [2,4,5]. The increase in life expectancy demonstrated here may be considered conservative due to changes in the patient population; DAAs may slow the progression of HCV, so the subset of patients who now require transplants may represent those with a more aggressive disease or other comorbid risk factors [2,3].

A limitation of the present study is that we were unable to identify which patients had been treated with DAA, though presumably most had, and which achieved a sustained virologic response. Survival is thought to be related to the timing of DAA treatment, and careful timing of both treatment and transplant can be used to optimize life expectancy [7].

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Table 1
Life expectancies by age at transplant, current age, sex, medical conditions, and other factors.

	Age at transplant											
	40			50			60			70		
Current age	40	41	45	50	51	55	60	61	65	70	71	75
Males												
General Population	39	38	34	30	29	26	22	21	18	15	14	11
Overall	20	20	18	16	16	14	13	13	11	10	10	8
Diabetes												
Yes	17	17	16	14	14	13	12	12	10	9	9	8
No	20	20	18	17	17	15	14	14	12	11	11	9
Hepatic encephalopathy												
Severe	16	16	14	13	13	11	10	10	9	8	8	6
Mild	20	20	18	16	16	14	13	13	11	10	10	8
None	23	23	20	18	18	16	15	15	12	12	11	9
Dialysis												
Yes	13	14	12	11	11	9	8	9	7	6	7	5
No	22	22	20	18	17	15	14	14	12	11	11	9
Length of Hospital Stay												
0–30 days	21	21	19	17	17	15	14	14	12	11	9	9
31+ days	11	12	10	9	10	8	8	8	7	6	6	5
Females												
General Population	43	42	38	33	33	29	25	24	21	17	16	13
Overall	20	20	18	16	16	14	13	13	11	10	10	8
Diabetes												
Yes	17	17	15	14	14	12	11	11	10	9	9	7
No	20	20	18	17	17	15	13	13	11	11	11	9
Hepatic encephalopathy												
Severe	16	16	14	13	13	11	10	10	9	8	8	6
Mild	21	20	18	16	16	14	13	13	11	10	10	8
None	23	23	21	19	18	16	15	15	12	11	11	9
Dialysis												
Yes	14	14	12	11	11	10	8	9	7	6	7	5
No	23	22	20	18	18	16	14	14	12	11	11	9
Length of Hospital Stay												
0–30 days	21	21	19	17	17	15	14	14	12	11	11	9
31+ days	11	12	10	9	10	8	7	8	7	6	6	5

Life expectancy for HCV transplant recipients has improved significantly since 2013, yet remains significantly reduced from the general population. Survival varies by age and medical risk factors. The figures reported here may aid physicians in prioritizing transplant candidates and maximizing life expectancy based on observed patient risk factors.

Research support

None

Disclaimer

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Declaration of competing interest

None

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.liver.2021.100069](https://doi.org/10.1016/j.liver.2021.100069).

References

- [1] Legaz I, Navarro Noguera E, Bolarín JM, Campillo JA, Moya R, Luna A, Miras M, Minguela A, Álvarez-López MR, Muro M. Patient sex in the setting of liver transplant in alcoholic liver disease. *Exp Clin Transplant* 2019;17(3):355–62 JunEpub 2018 Jun 28. PMID: 29957165. doi: [10.6002/ect.2017.0302](https://doi.org/10.6002/ect.2017.0302).
- [2] Crespo G, Trota N, Londoño MC, Mauro E, Baliellas C, Castells L, Castellote J, Tort J, Forns X, Navasa M. The efficacy of direct anti-HCV drugs improves early post-liver transplant survival and induces significant changes in waiting list composition. *J Hepatol* 2018;69(1):11–7 JulEpub 2018 Mar 2. PMID: 29481821. doi: [10.1016/j.jhep.2018.02.012](https://doi.org/10.1016/j.jhep.2018.02.012).
- [3] Belli LS, Berenguer M, Cortesi PA, Strazzabosco M, Rockenschaub SR, Martini S, Morelli C, Donato F, Volpes R, Pageaux GP, Coilly A, Fagioli S, Amaddeo G, Perricone G, Vinaixa C, Berlakovich G, Facchetti R, Polak W, Muiesan P, Duvoux C. European Liver and Intestine Association (ELITA). Delisting of liver transplant candidates with chronic hepatitis C after viral eradication: a European study. *J Hepatol* 2016;65(3):524–31 SepEpub 2016 May 17. PMID: 27212241. doi: [10.1016/j.jhep.2016.05.010](https://doi.org/10.1016/j.jhep.2016.05.010).
- [4] Belli LS, Perricone G, Adam R, Cortesi PA, Strazzabosco M, Facchetti R, Karam V, Salizzoni M, Andujar RL, Fondevila C, De Simone P, Morelli C, Fabregat-Prous J, Samuel D, Agarwal K, Moreno Gonzales E, Charco R, Zieniewicz K, De Carlis L, Duvoux C. all the contributing centers (www.eltr.org) and the European Liver and Intestine Transplant Association (ELITA). Impact of DAAs on liver transplantation: major effects on the evolution of indications and results. An ELITA study based on the ELTR registry. *J Hepatol* 2018;69(4):810–7 OctEpub 2018 Jun 27. PMID: 29940268. doi: [10.1016/j.jhep.2018.06.010](https://doi.org/10.1016/j.jhep.2018.06.010).
- [5] Cholankeril G, Li AA, March KL, Yoo ER, Kim D, Snyder H, Gonzalez SA, Younossi ZM, Ahmed A. Improved outcomes in HCV patients following liver transplantation during the era of direct-acting antiviral agents. *Clin Gastroenterol Hepatol* 2018;16(3):452–3 MarEpub 2017 Aug 31. PMID: 28838786. doi: [10.1016/j.cgh.2017.08.020](https://doi.org/10.1016/j.cgh.2017.08.020).
- [6] Shavelle R.M., Saur R.C., Kwak J.H., Brooks J.C., Hameed B. (2021). Life expectancy after liver transplantation for NASH. *Progress in Transplantation*, in press.
- [7] Chhatwal J, Samur S, Kues B, Ayer T, Roberts MS, Kanwal F, Hur C, Donnell DM, Chung RT. Optimal timing of hepatitis C treatment for patients on the liver transplant waiting list. *Hepatology* 2017;65(3):777–88 MarEpub 2017 Jan 6. PMID: 27906468; PMCID: PMC5319880. doi: [10.1002/hep.28926](https://doi.org/10.1002/hep.28926).

- [8] Shavelle RM, Saur RC, Kwak JH, Brooks JC, Hameed B. Life expectancy after liver transplantation for alcoholic cirrhosis. *Progress in Transplantation* 2021;31:345–56.

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