

DR. NEEHAR DILIP PARIKH (Orcid ID : 0000-0002-5874-9933)

Article type : Editorial

**Edging Closer to Commonplace: Assessing the Growth of Living Donor Liver Transplant  
in the United States.**

Seth A. Waits<sup>1</sup>, Neehar D. Parikh<sup>2</sup>

1. Department of Surgery, University of Michigan, Ann Arbor, MI

2. Division of Gastroenterology and Hepatology, University of Michigan, Ann Arbor, MI

**Corresponding Author:**

Neehar D Parikh

1500 E Medical Center Dr

Ann Arbor, MI 48109

E: [ndparikh@med.umich.edu](mailto:ndparikh@med.umich.edu)

P: 734-936-8643

Conflicts of Interest: The authors report no relevant conflicts of interest related to this manuscript.

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1002/LT.26077](https://doi.org/10.1002/LT.26077)

This article is protected by copyright. All rights reserved

**Word Count:** 975 with references

**Key Words:** LDLT, DDLT, NLDAC

More than 13,000 patients are added to the waitlist for life saving liver transplants across the United States each year. Despite the need, demand for liver allografts outpaces supply with nearly 1200 patients dying while awaiting a liver transplant annually.(1) This disparity is likely multifactorial, including donor availability and quality, changes in the epidemiology of liver disease, and liver transplant allocation policy.(2-4) In this issue of *Liver Transplantation*, we gain insight into a potential solution to the lack of donor livers – living donor liver transplant (LDLT). While deceased donor liver transplant (DDLT) makes up the vast majority of transplants conducted in the US, LDLT is growing and may address the needs of a population not currently served by our DDLT allocation system.

In this manuscript by Cotter et al, we gain a contemporary snapshot at LDLT practices and outcomes in the United States.(5) Using data obtained from the United Network for Organ Sharing (UNOS) the authors review national trends, recipient survival, and donor outcomes in LDLT over the last 10 years. Expanding on the previous work done by the Adult-to-Adult Living Donor Liver Transplantation Cohort (A2ALL)(6), the authors find that the number of LDLTs doubled over the study period, reaching a peak of nearly 500 transplants in 2019. Survival compared favorably to DDLT at 1 and 5 years and confirmed previous literature which suggested a steep center specific learning curve, with the best outcomes in centers that perform more than 20 LDLTs annually.

This analysis contributes to our understanding of LDLT in several important ways. First, it shows that LDLT is a scalable intervention with acceptable recipient outcomes and overall

favorable donor outcomes, even in centers which recently opened LDLT programs. Second, it shows that the volume-based learning curve necessary to obtain the best recipient outcomes, which allows for programs to set benchmarks for volume and outcomes. Third, it shows relevant mediators for worse recipient outcomes which could help in better donor-recipient selection. These include older donor age, recipient diabetes, higher recipient donor BMI, and need for recipient ventilator support. Finally, the analysis shows similar outcomes between unrelated and related LDLT donor-recipient pairs, allaying concerns about the impact of relatively rare immune-mediated events, such as graft versus host disease in related LDLT pairs.

There are contextual factors for consider when interpreting these data. First, this is a national analysis using data which lacks granularity on mediators of outcomes and given the complexity of donor and recipient selection, unmeasured confounding may play a role. The center experience is only volume-based and lacks salient factors, like individual surgical experience or other components of the LDLT team which may impact outcomes. We only have limited follow-up reflecting outcomes in the most recent population of LDLT population, so ongoing assessment will be important, especially as the increases in LDLT volume are concentrated in recent years. Finally, beyond survival and hospitalization, more comprehensive donor outcomes are needed to ensure there are not long-term adverse sequelae of living donation such as impairment in functional ability or patient reported outcomes.

### **The Future of LDLT in the US**

As LDLT becomes more commonplace across the United States, transplant centers that wish to increase the number of living donors must be innovative in their solutions to tackling the learning curve. Mentorship and collaboration between high volume centers and those which seek to grow their LDLT programs are pragmatic ways to transfer knowledge and skill. Quality improvement collaboratives offer the opportunity for ongoing assessment and real time tracking of programmatic outcomes.

The liver transplant community is primed for the growth of LDLT. Across the country initiatives to support living liver donors in financial hardship are finally coming to fruition. Organizations such as National Living Donor Assistance Center (NLDAC) recently received a boost when the US Health Services and Resources Administration expanded the final rule to allow for additional financial support for living donors.(7) Similarly, some states have passed or are considering legislation to provide financial support for donors for expenses or missed time from work related to living donation, in the form of tax credits or employer reimbursement.(8)

Removing barriers to donation, sharing best practices in donor and recipient selection along with technical aspects of LDLT, and appropriate tracking of granular outcomes as centers start or grow their programs will be paramount as we enter a new era of LDLT in the US.

## References

1. Kwong AJ, Kim WR, Lake JR, Smith JM, Schladt DP, Skeans MA, Noreen SM, et al. OPTN/SRTR 2019 Annual Data Report: Liver. *Am J Transplant* 2021;21 Suppl 2:208-315.
2. DeRoos LJ, Zhou Y, Marrero WJ, Tapper EB, Sonnenday CJ, Lavieri MS, Hutton DW, et al. Assessment of National Organ Donation Rates and Organ Procurement Organization Metrics. *JAMA Surg* 2021;156:173-180.
3. Younossi ZM, Stepanova M, Ong J, Trimble G, AlQahtani S, Younossi I, Ahmed A, et al. Nonalcoholic steatohepatitis is the most rapidly increasing indication for liver transplantation in the United States. *Clinical Gastroenterology and Hepatology* 2021;19:580-589. e585.
4. Chyou D, Karp S, Shah MB, Lynch R, Goldberg DS. A 6-Month Report on the Impact of the Organ Procurement and Transplantation Network/United Network for Organ Sharing Acuity Circles Policy Change. *Liver Transpl* 2020.
5. Cotter TG, Minhem M, Wang J, Peeraphatdit T, Ayoub F, Pillai A, Hernandez-Alejandro R, et al. Living-Donor Liver Transplantation in the United States: Evolution of Frequency, Outcomes, Center Volumes and Factors Associated with Outcomes. *Liver Transplantation* 2021.
6. Freise C, Gillespie B, Koffron A, Lok A, Pruett T, Emond J, Fair J, et al. Recipient morbidity after living and deceased donor liver transplantation: findings from the A2ALL Retrospective Cohort Study. *American Journal of Transplantation* 2008;8:2569-2579.
7. New Rule Expands the Scope of Reimbursable Expenses for Living Organ Donation. In: *Health Resources & Services Administration*; 2020.
8. Emamaullee J, Tenorio L, Khan S, Butler C, Kim S, Tucker-Seeley R, Kwon Y, et al. Living donor financial assistance programs in liver transplantation: The global perspective. *Clinical Transplantation* 2020;34:e14073.