Importance  Despite the acceptance of living-donor liver transplant (LDLT) as a lifesaving procedure for end-stage liver disease, it remains underused in the United States. Quantification of lifetime survival benefit and the Model for End-stage Liver Disease incorporating sodium levels (MELD-Na) score range at which benefit outweighs risk in LDLT is necessary to demonstrate its safety and effectiveness.

Objective  To assess the survival benefit, life-years saved, and the MELD-Na score at which that survival benefit was obtained for individuals who received an LDLT compared with that for individuals who remained on the wait list.

Design, Setting, and Participants  This case-control study was a retrospective, secondary analysis of the Scientific Registry of Transplant Recipients database of 119,275 US liver transplant candidates and recipients from January 1, 2012, to September 2, 2021. Liver transplant candidates aged 18 years or older who were assigned to the wait list (N=116,455) or received LDLT (N=2,820) were included. Patients listed for retransplant or multiorgan transplant and those with prior kidney or liver transplants were excluded.

Exposures  Living-donor liver transplant vs remaining on the wait list.

Main Outcomes and Measures  The primary outcome of this study was life-years saved from receiving an LDLT. Secondary outcomes included 1-year relative mortality and risk, time to equal risk, time to equal survival, and the MELD-Na score at which that survival benefit was obtained for individuals who received an LDLT compared with that for individuals who remained on the wait list. MELD-Na score ranges from 6 to 40 and is well correlated with short-term survival. Higher MELD-Na scores (>20) are associated with an increased risk of death.

Results  The mean (SD) age of the 119,275 study participants was 55.1 (11.2) years, 63% were male, 0.9% were American Indian or Alaska Native, 4.3% were Asian, 8.2% were Black or African American, 15.8% were Hispanic or Latino, 0.2% were Native Hawaiian or Other Pacific Islander, and 70.2% were White. Mortality risk and survival models confirmed a significant survival benefit for patients receiving an LDLT who had a MELD-Na score of 11 or higher (adjusted hazard ratio, 0.64 [95% CI, 0.47-0.88]; P=0.006). Living-donor liver transplant recipients gained an additional 13 to 17 life-years compared with patients who never received an LDLT.

Conclusions and Relevance  An LDLT is associated with a substantial survival benefit to patients with end-stage liver disease even at MELD-Na scores as low as 11. The findings of this study suggest that the life-years gained are comparable to or greater than those conferred by any other lifesaving procedure or by a deceased-donor liver transplant. This study’s findings challenge current perceptions regarding when LDLT survival benefit occurs.
Liver transplant is a life-saving procedure. The survival benefit has been established for deceased-donor liver transplant for patients with end-stage liver disease at a Model for End-stage Liver Disease incorporating sodium levels (MELD-Na) score of 15 or higher. However, each year, nearly 20% of patients awaiting a liver transplant in the United States die or become too sick for the transplant, demonstrating a severe shortage of donors and the dire necessity to increase the donor pool.

Given current allocation in the United States, patients with low MELD-Na scores (<15) rarely receive livers from deceased donors, yet these patients constitute the majority of new candidates added to the wait list. Patients with low MELD-Na scores must rely on either living donors or expanded-criteria deceased donors if they are to receive a transplant. However, the number of living-donor liver transplants (LDLTs) has scarcely increased during the past 20 years and still accounts for only 5% of liver transplants in the United States. The decision to use an LDLT involves weighing the risks of hepatectomy to the potential donor with the benefits to the recipient. Although donor risk is defined, part of the stagnation may stem from a lack of adequately powered studies providing clear quantification of recipient survival benefits and lifetime saved with an LDLT, particularly at lower MELD-Na scores. In a subanalysis of the Adult-to-Adult Living Donor Liver Transplantation Cohort Study (A2ALL), the landmark multicenter living-donor consortium, the survival benefit of an LDLT was suggested at MELD-Na scores less than 15. However, this subanalysis was not powered to characterize a MELD-Na cutoff at which an LDLT provides more benefit than risk, nor did it quantify lifetime survival benefit. Therefore, to date, patients with low MELD-Na scores continue to experience a lack of accurate and consistent guidance concerning the ideal timing of an LDLT.

To address this need, we analyzed the Scientific Registry of Transplant Recipients (SRTR) database of liver transplant candidates and recipients from January 1, 2012, to September 2, 2021, to assess the survival benefit, life-years saved, and the MELD-Na score at which that survival benefit was obtained compared with those who remained on the wait list.

Methods

Data Sources
This case-control study used data from the SRTR. The SRTR data system includes data on all donors, waitlisted candidates, and transplant recipients in the United States, submitted by the members of the Organ Procurement and Transplantation Network.

Study Population
The study population (N = 119,275) included patients aged 18 years or older who were assigned to the wait list (n = 116,455) or received a living-donor transplant (n = 2,820) between January 1, 2012, and September 2, 2021. Patients listed for retransplant or multiorgan transplant were excluded, as were patients with prior kidney or liver transplants. eFigure 1 in the Supplement provides a population workflow diagram with the number of patients retained for each exclusion criterion. For patients listed before use of the MELD-Na score, MELD scores were recalculated to include sodium. We recalculated MELD-Na to include sodium for all patients listed on or after January 1, 2016, or a total of 73,196 waitlisted patients and 1,891 patients receiving an LDLT, respectively. The biochemical MELD-Na score without exception points was used for the analysis. The race and ethnicity of the study participants were defined and recorded by the SRTR. The study was reviewed by an ethical committee (Colorado Multiple Institutions Review Board) and was determined to be nonhuman participants research, with a waiver of informed patient consent.

Statistical Analysis
All study participants were stratified by MELD-Na scores at 6 to 10, 11 to 13, 14 to 16, 17 to 19, and 20 to 26 to provide a consistent representation of relative mortality, risk, and survival across MELD score ranges. All MELD score ranges other than 20 to 26 were adequately powered for all subsequent analyses. As such, a MELD score from 20 to 26 was excluded from the analysis of life-years from transplant. Survival times for waitlisted candidates started for all patients at the date of listing and were censored at the date of death or on removal from the wait list. Survival times for transplant recipients started at the date of transplant and were censored at the date of death or last follow-up. The mortality rate was calculated by dividing the number of deaths by the total patient-years and was reported as the rate of death per 1000 patient-years. Unadjusted hazard ratios were calculated by dividing the mortality rate of patients receiving an LDLT by that of waitlisted candidates. Adjusted hazard ratios were calculated with Cox proportional hazard regression analysis and adjusted for age at listing, sex, and primary diagnosis. The Cox proportional hazard model is a semiparametric regression method that models the association between survival time and 1 or more variables or covariates. Patients receiving a deceased-donor liver transplant were analyzed identically to those receiving an LDLT. All survival probability curves were generated with the nonparametric Kaplan-Meier estimation. Time to equal risk was reported as the day at which transplant survival intersected
the probability of waitlist survival. Time to equal survival was reported as the day at which the cumulative areas under the LDLT and waitlisted curves were equal.\textsuperscript{13} Life-years from transplant\textsuperscript{10} was calculated with parametric survival regression assuming a log-normal distribution and extrapolated to 10 000 days, or 27.38 years.\textsuperscript{14} Survival benefit in life-years was calculated by subtracting the median number of days on the waitlist from life-years from transplant. Any participant without a listing date or MELD-Na score was removed from all analyses. All analyses were performed with the R statistical language, version 4.1.2 (R Core Team and the R Foundation for Statistical Computing).\textsuperscript{15} Throughout this study, we adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

### Results

The mean (SD) age of the 119 275 study participants was 55.1 (11.2) years, 75 112 (63%) were male, 1089 (0.9%) were American Indian or Alaska Native, 5097 (4.3%) were Asian, 9725 (8.2%) were Black or African American, 18 838 (15.8%) were Hispanic or Latino, 18 997 (15.9) were Latino, and 83 714 (70.2%) were White. Compared with patients on the wait list, recipients of an LDLT were younger (mean [SD] age, 53.0 [13.2] years vs 55.2 [11.1] years), more often female (1315 of 2820 [46.6%] female in the LDLT group vs 42848 of 116 455 [36.8%] female on the wait list; odds ratio, 0.63; 95% CI, 0.59-0.68; \(P < .001\)), more educated, and more likely to have alcoholic cirrhosis. Any participant without a listing date or MELD-Na score was removed from all analyses. All analyses were performed with the R statistical language, version 4.1.2 (R Core Team and the R Foundation for Statistical Computing).\textsuperscript{15} Throughout this study, we adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

### Table. Characteristics of Wait List Candidates and Patients Who Received an LDLT, 2012-2021

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients, No. (%)</th>
<th>LDLT (n = 2820)</th>
<th>Total (N = 119 275)</th>
<th>(P) value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, y</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>55.2 (11.1)</td>
<td>53.0 (13.2)</td>
<td>55.1 (11.2)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Median (range)</td>
<td>57.0 (18.0-82.0)</td>
<td>56.0 (18.0-77.0)</td>
<td>57.0 (18.0-82.0)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>42 848 (36.8)</td>
<td>1315 (46.6)</td>
<td>44 163 (37.0)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Male</td>
<td>73 607 (63.2)</td>
<td>1505 (53.4)</td>
<td>75 112 (63.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>1076 (0.9)</td>
<td>13 (0.5)</td>
<td>1089 (0.9)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>5014 (4.3)</td>
<td>83 (2.9)</td>
<td>5097 (4.3)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>9635 (8.3)</td>
<td>90 (3.2)</td>
<td>9725 (8.2)</td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>18 491 (15.9)</td>
<td>347 (12.3)</td>
<td>18 838 (15.8)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>215 (0.2)</td>
<td>(0.2)</td>
<td>220 (0.2)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>White</td>
<td>81 445 (69.9)</td>
<td>2269 (80.5)</td>
<td>83 714 (70.2)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>579 (0.5)</td>
<td>13 (0.5)</td>
<td>592 (0.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>18 648 (16.0)</td>
<td>349 (12.4)</td>
<td>18 997 (15.9)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Non-Latino or unknown</td>
<td>97 807 (84.0)</td>
<td>2471 (87.6)</td>
<td>100 278 (84.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school (grades 9-12)</td>
<td>45 301 (38.9)</td>
<td>852 (30.2)</td>
<td>46 153 (38.7)</td>
<td></td>
</tr>
<tr>
<td>Attended college or technical school</td>
<td>28 619 (24.6)</td>
<td>650 (23.0)</td>
<td>29 269 (24.5)</td>
<td></td>
</tr>
<tr>
<td>Associate or bachelor degree</td>
<td>21 784 (18.7)</td>
<td>724 (25.7)</td>
<td>22 508 (18.9)</td>
<td></td>
</tr>
<tr>
<td>Postcollege graduate degree</td>
<td>8744 (7.5)</td>
<td>361 (12.8)</td>
<td>9105 (7.6)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Grade school (grades 0-8)</td>
<td>6060 (5.2)</td>
<td>101 (3.6)</td>
<td>6161 (5.2)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>391 (0.3)</td>
<td>7 (0.2)</td>
<td>398 (0.3)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>5556 (4.8)</td>
<td>125 (4.4)</td>
<td>5681 (4.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Primary etiology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcoholic cirrhosis</td>
<td>27 920 (24.0)</td>
<td>432 (15.3)</td>
<td>28 352 (23.8)</td>
<td></td>
</tr>
<tr>
<td>NASH cirrhosis</td>
<td>18 458 (15.8)</td>
<td>558 (19.8)</td>
<td>19 016 (15.9)</td>
<td></td>
</tr>
<tr>
<td>Hepatitis C cirrhosis</td>
<td>4018 (3.5)</td>
<td>24 (0.9)</td>
<td>4042 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B cirrhosis</td>
<td>1908 (1.6)</td>
<td>29 (1.0)</td>
<td>1937 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Hepatocellular carcinoma</td>
<td>13 167 (11.3)</td>
<td>231 (8.2)</td>
<td>13 398 (11.2)</td>
<td></td>
</tr>
<tr>
<td>Non-HCC malignancy</td>
<td>948 (0.9)</td>
<td>79 (2.8)</td>
<td>1027 (0.9)</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Cholestatic liver disease (PSC, PBC, or BA)</td>
<td>8608 (7.4)</td>
<td>680 (24.1)</td>
<td>9288 (7.8)</td>
<td></td>
</tr>
<tr>
<td>Noncholestatic cirrhosis (other)</td>
<td>15 082 (13.0)</td>
<td>399 (14.1)</td>
<td>15 481 (13.0)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>25 691 (22.1)</td>
<td>382 (13.5)</td>
<td>26 073 (21.9)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>655 (0.6)</td>
<td>6 (0.2)</td>
<td>661 (0.6)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: BA, biliary atresia; HCC, hepatocellular carcinoma; LDLT, living-donor liver transplant; NASH, nonalcoholic steatohepatitis; PBC, primary biliary cholangitis; PSC, primary sclerosing cholangitis.

\(a\) All patients on the wait list (excluding the individuals who received an LDLT) at the listing.

\(b\) The number of patients was less than 10 and therefore not reported for privacy reasons.
Relative hazard ratios were calculated at 1 year on the wait list and after transplant across 5 MELD categories (scores 6-10, 11-13, 14-16, 17-19, and 20-26). One-year, unadjusted hazard ratios (A) and covariate-adjusted Cox proportional hazard ratios (B) were reported with 95% CIs and significance thresholds. Unadjusted hazard ratios were calculated by dividing the mortality rate of patients receiving a transplant by the mortality rate of waitlisted candidates.

A similar mortality rate existed between wait list candidates (56 deaths per 1000 patient-years) and recipients of an LDLT (60 deaths per 1000 patient-years) for very low MELD-Na scores (6-10) (eTable 1 in the Supplement), whereas the mortality rate was significantly less (between 34% and 72%) for all higher scores in MELD-Na groups. The survival benefit of LDLT was significant at a MELD-Na score as low as 11, with a 34% (95% CI, 17.4%-52.0%) decrease in mortality compared with the wait list. Unadjusted (Figure 1A) and covariate-adjusted (Figure 1B) mortality risk models confirmed the survival benefit of an LDLT for patients with a MELD-Na score of 11 or higher (MELD-Na scores 11-13: adjusted hazard ratio, 0.64 [95% CI, 0.47-0.88]; P = .006) (Figure 1B; eTable 2 in the Supplement) at 1 year after transplant. At a MELD-Na score of 14 to 16, mortality decreased by approximately 50% (hazard ratio, 0.47 [95% CI, 0.34-0.66]; P < .001) (Figure 1B; eTable 2 in the Supplement), and the benefit of an LDLT was associated with an increase in MELD-Na scores of 20 to 26 (Figure 1). For comparison, the risk of mortality was assessed for patients who received a deceased-donor liver transplant across the same MELD-Na categories (eFigure 3 in the Supplement). A consistent pattern of decreased risk for recipients of deceased-donor liver transplant was observed starting at MELD-Na scores of 11 to 13 (hazard ratio, 0.76 [95% CI, 0.69-0.84]; P = .006).

The probability of death from an LDLT for patients with very low MELD-Na scores (6-10) was greater than that for patients on the wait list for the first 259 days, at which point the risk of death for both groups was equal (time to equal risk); at 471 days, the probability of survival in both groups was equal (time to equal survival) (Figure 2A). As the MELD-Na score increased, the time to equal risk of death decreased (MELD-Na scores 11-13 = 110 days [Figure 2B]; MELD-Na scores 14-16 = 90 days [Figure 2C]; MELD-Na scores 17-19 = 51 days [Figure 2D]; and MELD-Na scores 20-26 = 1 day [Figure 2E]). The time to equal survival for patients on the wait list and those who received an LDLT also decreased as the MELD-Na score increased (MELD-Na scores 11-13 = 219 days [Figure 2B]; MELD-Na scores 14-16 = 161 days [Figure 2C]; MELD-Na scores 17-19 = 51 days [Figure 2D]; and MELD-Na scores 20-26 = 1 day [Figure 2E]), demonstrating that the survival benefit of an LDLT occurs much earlier for patients with a higher MELD-Na score. The survival benefit during a lifetime or life-years from transplant (Figure 3; eTable 3 in the Supplement) for patients who received an LDLT, even at very low MELD-Na scores, was substantial compared with remaining on the wait list and ranged from 13 to 17 additional years saved.

Discussion

We present evidence from what is to our knowledge the largest study to date that shows the significant survival ben-
efit of an LDLT for patients with end-stage liver disease and a MELD-Na score as low as 11, with a 34% decrease in mortality compared with that for patients on the wait list. Analysis of life-years from transplant showed that patients receiving an LDLT can expect to gain an additional 13 to 17 years of life compared with patients who never received a transplant. This survival benefit, particularly at low MELD-Na scores, is remarkable because previous studies with deceased donors argued that the benefit of a transplant occurs at MELD-Na scores of 15 or higher. Previous studies

Figure 2. Survival Advantage of Living-Donor Liver Transplant (LDLT) vs Remaining on the Wait List Across 5 Model for End-stage Liver Disease Incorporating Sodium Levels (MELD-Na) Score Categories

Survival probability curves were calculated for waitlisted candidates (WL) and patients receiving an LDLT (LD) across 5 MELD score categories with the nonparametric Kaplan-Meier estimation. Time to equal risk (ER) was reported as the day at which transplant survival probability intersected wait list survival probability. Time to equal survival (ES) was reported as the day at which the cumulative areas under the curves were equal. All LDLT survival curves were statistically significant (P < .001) compared with those for the wait list.
benefit of an LDLT at MELD-Na scores below 15.8, 20, 21 The pre-}


tion data from deceased-donor liver transplants to inform prac-


trange of MELD-Na scores. Therefore, clinical care has relied 


strate the potential survival advantages of an LDLT across the 


far, there has been a paucity of data to adequately demon-


demand information of MELD-Na scores. 22 We found comparable benefits 


ting for an adequate graft-recipient weight ratio, and an LDLT 


constraints on recipient candidates according to size match-


a partial graft as opposed to a full graft; there may be more 


some essential respects. The former involves implantation of 


textualize risk-benefit discussions. 


form potential donors of the benefit to their recipient to con-


tifocation for a liver transplant and may have ramifications for alloca-


ity of our findings across these distinct eras. 


throughout all MELD-Na scores, confirming the generalizabil-


tion of MELD-Na scores. 22 We found comparable benefits 


acting antiviral therapy to cure chronic hepatitis C and imple-


fore and after 2016 to reflect the association between direct-


cation for a liver transplant (eTable 4 in the Supplement), we 


the changing etiologies of end-stage liver disease and the indi-


icate, and thus it would not materially change the expected 


indicate and those “healthier” than their MELD score would in-


ded to receive an LDLT, the time frame chosen coincides with the 


t the study limitations. First, the number of patients with high 


to our knowledge, the present study is the first to show a sig-


life-saving procedure. This study’s findings challenge current 


as performed in the United States, an LDLT confers a sub-


stantial survival benefit to patients with end-stage liver dis-


even at MELD-Na scores as low as 11. This benefit is 


associated with increasing MELD scores. The life-years 


gained are comparable to or greater than those of any other 


lifesaving procedure. This study’s findings challenge current 


perceptions regarding the MELD-Na score threshold 


at which a survival benefit is derived.

**Strengths and Limitations**

The strengths of this study are that it is adequately powered at 


MELD-Na scores at which patients most commonly 


receive an LDLT, the time frame chosen coincides with the 


maturation of the LDLT experience in the United States, and 


there are adequate numbers to evaluate different eras of 


predominant indications for a liver transplant. Small studies 


have measured the survival benefit of an LDLT; 8 however, 


to our knowledge, none have examined the lifetime survival 


benefit or have been adequately powered to investigate the 


full spectrum of patients with lower MELD-Na scores. To 


our knowledge, the present study is the first to show a sig-


nificant benefit in life-years saved over a lifetime following 


an LDLT.

Still, these data must be interpreted within the confines of 


the study limitations. First, the number of patients with high 


MELD-Na scores (>26) who received an LDLT was relatively small 


ingoing to US practice patterns of using an LDLT for patients with 


lower MELD-Na scores. Therefore, this study was not fully pow-


ered to provide an interpretation of the survival benefits of an 


LDLT for patients with MELD-Na scores higher than 26, al-


though the trend in survival benefit persisted. Similarly, the 


study was not powered to assess the survival advantage based 


on the etiology of end-stage liver disease; however, we ad-


dressed this shortcoming by adjusting models for etiology. As 


in all retrospective registry studies, one cannot exclude non-


random selection bias. This selection bias likely involved both 


those patients who were “sicker” than their MELD score would 


indicate and those “healthier” than their MELD score would 


indicate, and thus it would not materially change the expected 


life-year benefit. To address the potential association between 


the changing etiologies of end-stage liver disease and the indi-


cation for a liver transplant (eTable 4 in the Supplement), we 


evaluated the survival benefit for transplant candidates be-


fore and after 2016 to reflect the association between direct-


acting antiviral therapy to cure chronic hepatitis C and imple-


mentation of MELD-Na scores. 22 We found comparable benefits 


throughout all MELD-Na scores, confirming the generalizabil-


ity of our findings across these distinct eras.

**Conclusions**

As performed in the United States, an LDLT confers a sub-


stantial survival benefit to patients with end-stage liver dis-


ease even at MELD-Na scores as low as 11. This benefit is 


associated with increasing MELD scores. The life-years 


gained are comparable to or greater than those of any other 


lifesaving procedure. This study’s findings challenge current 


perceptions regarding when a liver transplant survival 


benefit occurs. Our results suggest that, for patients with 


MELD-Na scores higher than 11, nationwide acceptance of an 


LDLT as a superior alternative to waiting for a deceased 


donor will significantly increase survival compared with 


remaining on the wait list.
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Author Contributions: Dr Malamon had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Drs Jackson and Malamon contributed equally to this manuscript. Concept and design: Jackson, Kaplan, Schold, Pomposelli, Pomfret. Acquisition, analysis, or interpretation of data: Jackson, Malamon, Kaplan, Saben, Schold. Drafting of the manuscript: Jackson, Malamon, Kaplan, Saben. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Malamon, Kaplan, Schold. Administrative, technical, or material support: Jackson, Kaplan, Saben. Supervision: Jackson, Kaplan, Pomposelli, Pomfret.

Conflict of Interest Disclosures: Dr Pomfret reported being married to the current chair of the UNOS Liver and Intestinal Organ Transplantation Committee. No other disclosures were reported.

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REFERENCES


