

Outcomes of Pediatric Liver Transplant Are Unaffected by the Time or Day of Surgery

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Background

- Studies show that the “weekend effect” on common pediatric surgeries impacts patient outcomes, including a higher risk of death, blood transfusion, and procedural complications compared to weekday procedures.
- However, in adults, the time of day for liver transplantation (LT), a complex procedure, does not affect post-transplant outcomes.
- Whether this is true or not in children is unknown.

Objective

- To evaluate if weekend and weeknight liver transplants are associated with worse patient and graft survival in children.

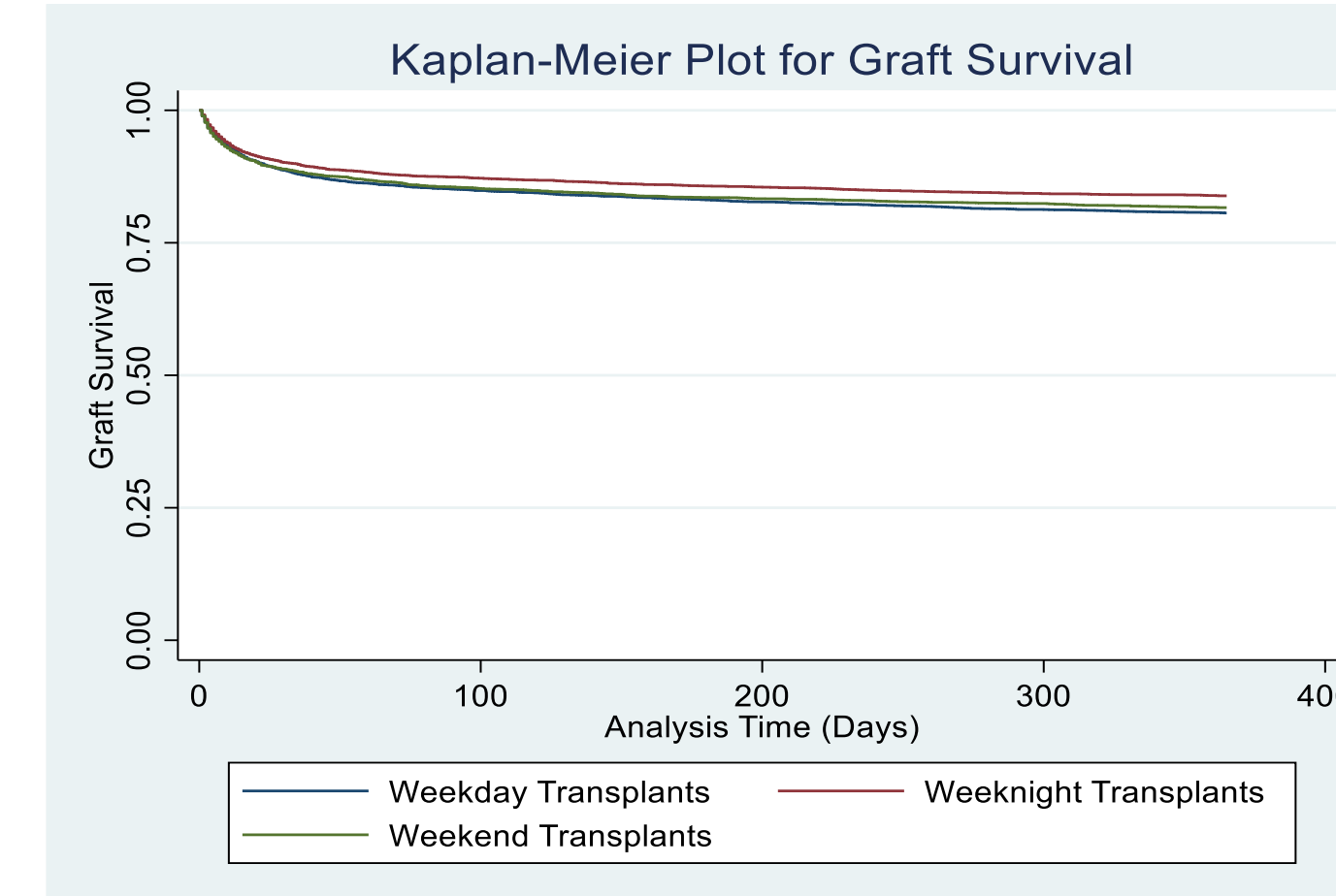
Methods

- Retrospective cohort analysis of pediatric liver transplants that occurred between 1988 and 2018 from the United Network of Organ Sharing (UNOS) database
- Excluded liver transplants in patients >17 years as well as all multi-organ transplants.
- The primary exposure was time of day of liver transplant surgery (weekday compared to weeknight and weekend LT).
- Primary outcomes of interest were graft failure and patient all-cause mortality by 7, 30, 90, and 365 days post-transplant
- Cox proportional hazard ratios determined patient and graft survival after controlling for confounding factors.

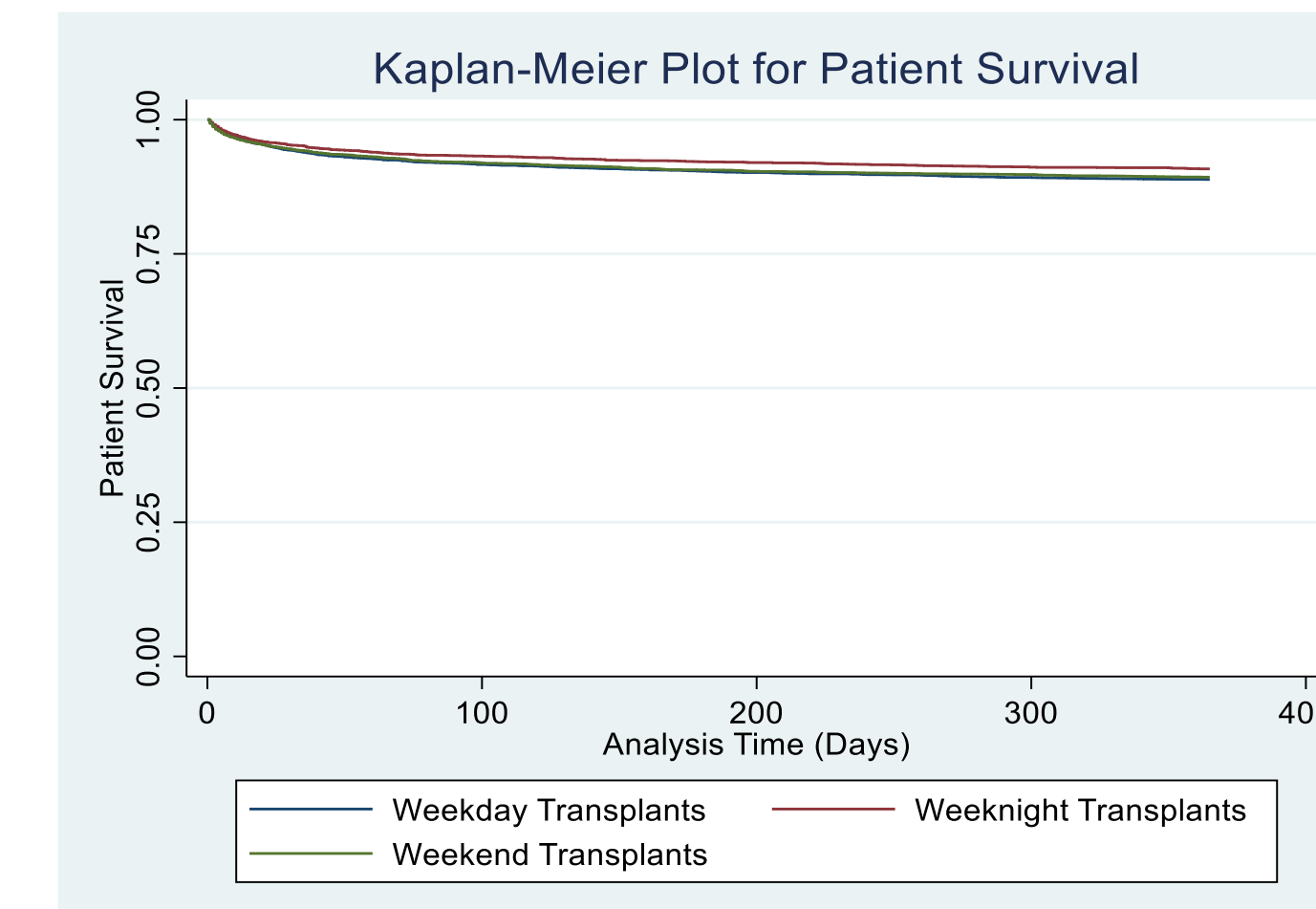
Study Sample Characteristics

	Total	Weekday	Weeknight	Weekend
Transplants Total	12,610	4,590	3,671	4,349
Recipient Characteristics				
Median Age, years (IQR)	2 (0-9)	2 (0-9)	2 (0-9)	3 (0-10)
Gender, n (%):				
Male	6,105 (48)	2,218 (48)	1,802 (49)	2,085 (48)
Female	6,505 (52)	2,372 (52)	1,869 (51)	2,264 (52)
Ethnicity, n (%):				
White	6,927 (55)	2,548 (55)	2,000 (54)	2,379 (55)
Black	2,212 (17)	803 (18)	642 (17)	767 (17)
Hispanic	2,507 (20)	899 (20)	752 (21)	856 (20)
Asian	602 (5)	212 (4)	170 (5)	220 (5)
Other	362 (3)	128 (3)	107 (3)	127 (3)
Serum creatinine, mean (SD)	0.51 (0.66)	0.51 (0.68)	0.51 (0.65)	0.51 (0.63)
Serum albumin, mean (SD)	3.18 (0.81)	3.17 (0.75)	3.19 (0.93)	3.18 (0.76)
MELD/PELD Score at transplant, mean (SD)	14.2 (14.5)	13.8 (14.5)	14.3 (14.5)	14.5 (14.5)
Transplant Occurred During MELD Era, n (%)	7,059 (56)	2,320 (51)	2,250 (61)	2,489 (57)
Recorded Presence of encephalopathy at time of transplant (any grade), n (%)	1,576 (13)	514 (11)	475 (13)	587 (13)
Ascites Present at transplant, n (%)	2,467 (20)	826 (18)	774 (21)	867 (20)
Re-transplant	1,869 (15)	709 (15)	518 (14)	642 (15)
Primary Indication for Transplant, n (%)				
Biliary Atresia/Cholelith Cyst	4,779 (38)	1,776 (39)	1,400 (38)	1,603 (37)
Genetic/Metabolic	2,522 (20)	884 (19)	774 (21)	864 (20)
Autoimmune	652 (5)	250 (5)	169 (5)	233 (5)
Tumor/Malignancy	833 (7)	301 (7)	245 (7)	287 (6)
Other Fulminant	1,696 (13)	597 (13)	496 (14)	603 (14)
Other Chronic	2,128 (17)	782 (17)	587 (16)	759 (18)
Donor Characteristics				
Median Age, years (IQR)	8 (2-18)	8 (2-18)	8 (2-18)	7 (2-17)
Gender, n (%)				
Male	7,420 (59)	2,685 (59)	2,203 (60)	2,532 (58)
Female	5,190 (41)	1,905 (41)	1,468 (40)	1,817 (42)
Split Liver, n (%)	3,230 (26)	1,181 (26)	1,036 (28)	1,013 (23)
Donor Location, n (%)				
Local	4,882 (38)	1,849 (40)	1,416 (38)	1,617 (37)
Regional	4,984 (40)	1,836 (40)	1,458 (40)	1,690 (39)
National	2,744 (22)	905 (20)	797 (22)	1,042 (24)
Donor Cause of Death, n (%)				
Anoxia	3,354 (27)	1,193 (26)	979 (27)	1,182 (27)
CVA/Stroke	1,669 (13)	617 (13)	496 (13)	556 (13)
Head Trauma	6,346 (50)	2,291 (50)	1,878 (51)	2,177 (50)
CNS Tumor	76 (1)	28 (1)	22 (1)	26 (1)
Other	1,165 (9)	461 (10)	296 (8)	408 (9)
Operative Characteristics				
Median Cold-Ischemia Time, hours (IQR)	8 (6-10)	8 (6-11)	7 (6-10)	8 (6-10)
Previous Abdominal Surgery, n (%)	5,293 (42)	1,887 (41)	1,612 (44)	1,794 (41)
Portal Vein Thrombosis, n (%)	406 (3)	135 (3)	122 (3)	149 (3)
Survival				
Overall Graft Survival (%)				
7 day	95	95	95	94
30 day	89	89	90	89
90 day	86	85	87	86
1 year	82	81	84	82
Overall Patient Survival (%)				
7 day	97	97	98	97
30 day	95	94	95	95
90 day	92	92	93	92
1 year	90	89	91	89

Kaplan Meier Plots



Log-rank test comparing weekday and weeknight survival curves: for graft survival, the survival plots were statistically different (p<0.001). For Patient survival, curves were also significantly different (p=0.005).



A log-rank test was also performed comparing weekday and weekend survival curves for both graft and patient survival. Neither patient survival (p = 0.56) nor graft survival (p = 0.26) revealed statistical differences.

Weekday vs Weeknight Hazard Ratios

	Graft Failure	Patient Mortality
Time Post Liver Transplant	*Adjusted (95% CI)	*Adjusted (95% CI)
7 days	0.96 (0.69-1.35)	0.90 (0.55-1.45)
30 days	0.87 (0.69-1.09)	0.83 (0.59-1.18)
90 days	0.91 (0.74-1.12)	0.93 (0.69-1.25)
1 year	0.91 (0.76-1.09)	0.94 (0.74-1.21)

* Adjusted for recipient age, recipient gender, recipient ethnicity, indication for transplant, recipient MELD/PELD score, donor age, donor cause of death, donor location, cold-ischemia time, ascites present at time of transplant, encephalopathy present at time of transplant, portal vein thrombosis, previous abdominal surgery, split liver grafts, and pre MELD vs MELD era.

Weekday vs Weekend Hazard Ratios

	Graft Failure	Patient Mortality
Time Post Liver Transplant	*Adjusted (95% CI)	*Adjusted (95% CI)
7 days	1.14 (0.83-1.58)	0.98 (0.61-1.55)
30 days	0.94 (0.76-1.18)	0.89 (0.63-1.24)
90 days	0.95 (0.78-1.16)	0.96 (0.72-1.28)
1 year	0.91 (0.77-1.09)	0.95 (0.75-1.20)

* Adjusted for recipient age, recipient gender, recipient ethnicity, indication for transplant, recipient MELD/PELD score, donor age, donor cause of death, donor location, cold-ischemia time, ascites present at time of transplant, encephalopathy present at time of transplant, portal vein thrombosis, previous abdominal surgery, split liver grafts, and pre MELD vs MELD era.

Conclusion

In summary, our findings suggest that time and day of liver availability and subsequent surgery is not independently associated with graft survival or patient mortality. In practice, we hope that this will reassure surgeons and medical staff to plan to accept and transplant a liver at any time of day. Our study is a first step to show that our current practices for pediatric transplantation provide equal outcomes no matter the time or day.