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Successful merging of data from the United Network for Organ Sharing and the Pediatric Health Information Systems databases

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Abstract

Data routinely collected through the United Network for Organ Sharing (UNOS) lack the detailed information on medical resource utilization and treatment costs required to accomplish for center-level comparisons of quality of care and cost for pediatric heart transplantation. We aimed to overcome this limitation by merging UNOS with the Pediatric Health Information Systems (PHIS) database, an administrative database containing inpatient, emergency department, ambulatory surgery, and observation unit information from over 40 not-for-profit, tertiary care pediatric hospitals. Utilizing a probabilistic match based on center, date of birth, recipient gender and transplant date within ± 2 days, more than 90% of eligible UNOS patients (N=2264) were successfully merged to their corresponding PHIS records. Thirty-day and 1-year mortality rates

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CONFLICTS OF INTEREST

None of the authors have any conflicts of interest to disclose.

AUTHORSHIP STATEMENTS

Concept/design: Getz, Aplenc; Data collection/management: Huang; Data analysis/interpretation: Getz, Li, Burstein, Rossano, Aplenc; Statistics: Li, Huang; Drafting article: Getz, He; Critical revision of article: Li, Huang, Burstein, Rossano, Aplenc; Approval of final article: All authors; Funding secured by: Aplenc.

observed for the merged cohort (3.2% and 9.0%, respectively) were comparable to those previously reported for pediatric heart transplants, as were the significant predictors of increased mortality. These results demonstrate that the established UNOS-PHIS cohort will provide a valid platform for subsequent research aimed at identifying center-level differences that could be exploited to optimize quality of care while minimizing cost across institutions.

Keywords

heart transplantation; hospitals; pediatric; mortality; research

INTRODUCTION

Pediatric cardiac transplantation is a complex, life-saving procedure that has been extensively studied in multiple publications. Many of the most impactful publications utilize the United Network for Organ Sharing (UNOS) database that includes extensive individual recipient and donor data. These data have been used in the evaluation of risk factors of mortality and graft failure, as well as a wide range of other clinical endpoints.¹ In addition, recent work has focused on center level characteristics associated with mortality.

Despite the richness of the UNOS data, important data elements are not available for analyses. Specifically, the UNOS data include very limited data on medical care prior to transplant listing, do not include resource utilization data, and do not include medical cost data. However, these data elements are at the core of data from the Pediatric Health Information Systems (PHIS) database. We have previously used the PHIS database to study multiple clinical outcomes in pediatric oncology, including studies of induction mortality risk factors, center level variation in outcomes, and PHIS adjusted costs of therapy. Furthermore, we and others have merged PHIS data with other data sets. While UNOS data have been merged with other data sets,^{4,5} to our knowledge, no other investigators have published a PHIS-UNOS merge. Based on our prior merging work, we hypothesized that we would successfully merge at least 90% of merge eligible patients and that a merged UNOS-PHIS data set would allow estimation of 30-day and one-year mortality rates post-transplantation by individual center.

METHODS

UNOS is the private, non-profit organization that manages the nation's organ transplant system. UNOS utilizes a secure online database to manage Organ Procurement and Transplant network (OPTN) data pertaining to every organ donation and transplant event occurring nationwide since October 1987. Information collected in this context includes detailed pre- and post-transplant demographic and clinical information for donor and recipient such as primary diagnosis, patient severity status, follow up information regarding supportive care, mortality and graft status.

PHIS is an administrative database containing inpatient, emergency department, ambulatory surgery, and observation data from 43 pediatric hospitals nationwide. This accounts for approximately 85% of the free-standing children's hospitals. Patients in the PHIS database

are assigned a de-identified medical record number and can be tracked across multiple hospitalizations. Specifically, PHIS contains diagnosis and procedure codes (by ICD-9-CM codes), and billed resource utilization data (e.g., pharmaceutical, imaging, and laboratory resources) of inpatient hospital encounters from as early as January 1st, 1999.

OPTN/UNOS extracted a dataset consisting of all cardiac transplants during the period from January 1, 2004 through March 31, 2015. Potential cases were identified by querying PHIS for patients 21 years or younger with a procedure code for heart transplantation (37.51). Once this list of PHIS patients was identified, a probabilistic merge was conducted to match patients from OPTN/UNOS database with those identified in PHIS as having received a heart transplantation based on center, date of birth, recipient gender and transplant date within ± 2 days.

Standard statistical methods were used to for univariate and bivariate analyses. Thirty day and one year mortality rates were computed for the merged population overall and by individual covariate (see Table 1 for listing). Multivariable log-binomial regression models were used to estimate crude and adjusted risk ratios (RR) and corresponding 95% confidence intervals (CI) comparing mortality rates by categories of each covariate. Covariates were included in the multivariable model if there was evidence of meaningful difference in mortality. In the case of highly correlated covariates, the strongest predictor was retained. Plots of hospital-specific 30-day and 1-year observed and model-based expected mortality rates were generated to assess variability in practice. All statistical analyses were performed using SAS (version 9.2, SAS Institute, Inc., Cary, NC).

Volumes of services, wage- and price-adjusted charges for each unit of service, and department-specific cost-to-charge ratios for each hospital were obtained from PHIS. Adjusted inpatient treatment costs were calculated by multiplying the adjusted charge by the hospital-specific cost-to-charge ratio for the relevant department then further adjusted to 2011 US dollars using the consumer price index. Adjusted total cost was calculated for each patient as the sum of the daily costs for a 30-day follow-up period beginning with the date of transplantation. Indirect costs and costs accrued at non-PHIS hospitals and in outpatient settings were not captured. The 30-day adjusted total cost were summarized as median and corresponding interquartile range for the population overall and by levels of covariates, as well as separately for patients who died within the first 30 days and those who did not.

The study protocol was approved by the CHOP Institutional Review Board. Additionally, the study plan was also reviewed and approved by UNOS prior to releasing the patient-identified OPTN data required for the merge with PHIS.

RESULTS

A total of 4,600 transplants to 4,494 patients were identified through OPTN/UNOS from January 1, 2004 through March 31, 2015. Of these, 2,509 were first transplants that occurred at PHIS institutions within the center-specific time periods when data were contributed to PHIS and thus eligible to be included in the merge. Of these, 2,264 (90.2%) were successfully merged.

Patients who were successfully identified in PHIS did not differ from patients who were not identified in PHIS in regard to gender, race, age at transplant, indication for transplant, waitlist time prior to transplant, insurance at transplant admission, UNOS status at registration or transplant, or life support requirements at transplant (Table 1). There was no obvious trend with respect to matching by year alone. With respect to institution, 18 of the 28 PHIS sites had match rates >90% (11 with rates >95%). However, there were a few sites with disproportionately lower overall match rates (<80%), and 50% of the unmatched first transplants were from three centers. Among those three institutions, the poor match rates were only during a subset of the study period in which they are documented by PHIS as not contributing all data elements. These institutions had a 100% match rate for the remainder of the study period. Excluding these sites from the merge during their period of incomplete submission results in a revised overall merge rate of 94.9%. Compared to the full UNOS population, patients included in the merged population were somewhat younger and slightly more likely to have a congenital indication for transplant.

Overall mortality rates within 30-days and one year were 3.2% and 9.0%, respectively. Risk factors for death within the two follow-up periods were similar. Infant age, congenital indication, shorter (i.e. less than 16 days) and longer waitlist times (i.e., greater than ~100 days), ECMO requirement at transplant, impaired hepatic function at transplant, and dialysis requirement at transplant were each significantly associated with a higher mortality risk based on bivariate analyses (Tables 2 and 3). Each of these factors, with the exception of shorter waitlist times, remained significantly predictive of mortality in multivariable analyses. Notably, center volume was not a significant predictor of mortality.

Across hospitals, there was moderate variability rates of 30-day (range: 0% to 9.4%; Figure 1, Panel A) and one-year mortality (range: 2.1% to 16.5%; Figure 1, Panel B). Overall, lower 30-day rates were not predictive of lower one-year mortality rates. Adjustment for individual level predictors of mortality explained more of center-level variability at one-year than at 30-days (Figure 1).

Total inpatient costs over the 30-day follow-up for the merged population overall and by level of covariates are summarized in Table 4. The median total inpatient cost from transplant was \$254,530 (IQR: 176,642–346,451); \$286,956 (IQR: 199,869–397,436) for congenital indications and \$226,944 (IQR: 156,071–309,472) for myopathy.

DISCUSSION

We present a successful merge between OPTN/UNOS and PHIS. As hypothesized, more than 90% of eligible patients were merged and no significant differences were observed in merged and unmerged patients at PHIS centers. Of note 18 out of the 28 total PHIS institutions had match rates greater than 90% with 11 institutions having match rates greater than 95%. Three institutions had disproportionately lower match rates for some portion of the study period. More than 50% of unmatched records were from three institutions which are documented by PHIS as not contributing all data components during some portion of the study period. The overall match rate was increased to 95% when periods of incomplete data submission are excluded. In the absence of an individual-level review against the

medical records, we are not able to determine the specific reasons for the non-matching of the remaining 5%. That said, the distributions of matched and unmatched patients were not meaningfully different. Additionally, our 90.2% overall match rate is consistent with that of previous PHIS linkages to other data sources performed by our group and others,^{6,7,8} including linkages to the Children's Oncology Group cooperative group clinical trial databases (90.9%), National Surgical Quality Improvement Program-Pediatric (92.5%), and the Scientific Registry of Transplant Recipients (90.8%). Additionally, while there was a qualitative difference between the merged population and overall UNOS population with respect to the distributions of age and indication for transplant (correlated with age) this is likely due to PHIS institutions' being restricted to a pediatric population. Thus, the established UNOS-PHIS cohort provides a valid representation of the experience of pediatric patients undergoing cardiac transplantation at free-standing tertiary pediatric institutions.

Overall 30-day and one-year mortality rates, 3.2% and 9.0%, respectively, are consistent with in-hospital mortality rates described by Law et al.⁹ Risk factors for mortality were also consistent with those identified in previous studies^{1,10} with the exception of center volume. This is likely due to center volume homogeneity among PHIS institutions. Specifically, high-volume centers were defined as performing an average of 12 transplants per year². The median number of transplants performed by PHIS-contributing institutions is 10 transplants per year, placing most PHIS institutions in the medium-high volume classification. In addition, the effect of short waitlist time on mortality was mitigated when adjusting for severity of disease at presentation. This may be due to patients with higher acuity at presentation being prioritized for transplant, thus decreasing waitlist duration.

Adjustment for patient-level factors resolved more of the center-level variability at one year than at 30 days. This demonstrates that observed patient-level factors better explain variability in mortality at one year compared with 30 days. Factors other than individual characteristics such as institutional-level variability in post-transplant management may explain the discrepancy between observed and predicted 30-day mortality rates. Moreover, patients are more likely to receive inpatient care within 30 days of transplantation, and thus institutional factors are more likely to influence outcomes at 30 days.

In summary, this study represents the first successful merger of data from OPTN/UNOS with data from a hospital administrative healthcare resource. The combined data draw on the strengths of the two individual data sets and afford the opportunity to perform studies that are not possible with either database alone. For example, evaluations of inpatient treatment costs and resource utilization. Work is ongoing to evaluate center level variation in survival outcomes, resource utilization and costs with the goal of optimizing clinical care and minimizing hospital costs.

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Panel A.

Panel B.

Figure 1.

Center level variability in 30-day (Panel A) and 1-year (Panel B) post-transplant mortality

Blue= Observed, Red= Expected

Table 1

Comparison of characteristics for patients between merged and unmerged patients

Characteristic	UNOS Population at PHIS-contributing Institutions				p-value ^d
	Total UNOS Population	UNOS Population at Non-PHIS Institutions	Total	Merged	Not Merged
N	4253	1744	2509	2264	245
Characteristic					
Sex					0.485
Female	1896 (44.6%)	761 (43.6%)	1135 (45.2%)	1019 (45.0%)	116 (47.4%)
Male	2357 (55.4%)	983 (56.4%)	1374 (54.8%)	1245 (55.0%)	129 (52.7%)
Race/Ethnicity					0.078
White	2319 (54.5%)	894 (51.3%)	1423 (56.7%)	1277 (56.4%)	146 (59.6%)
Black	939 (22.1%)	451 (25.9%)	488 (19.4%)	431 (19.0%)	57 (23.3%)
Asian	170 (4.0%)	64 (3.7%)	106 (4.2%)	96 (4.2%)	10 (4.1%)
Hispanic	698 (16.4%)	280 (16.1%)	420 (16.7%)	393 (17.4%)	27 (11.0%)
Other	67 (1.6%)	55 (3.1%)	72 (2.9%)	67 (3.0%)	5 (2.0%)
Insurance status					0.236
Public	2071 (48.7%)	881 (50.5%)	1190 (47.4%)	1078 (47.6%)	112 (47.1%)
Private	2048 (48.4%)	808 (46.3%)	1240 (49.4%)	1121 (49.5%)	119 (49.0%)
Other	120 (2.8%)	44 (2.5%)	76 (3.0%)	64 (2.8%)	12 (4.9%)
Indication for Transplant					0.265
Congenital	1763 (41.5%)	583 (33.4%)	1178 (47.0%)	1071 (47.3%)	107 (43.7%)
Mypopathy	2485 (58.4%)	1157 (66.3%)	1328 (52.9%)	1193 (52.7%)	135 (55.1%)
Age at transplant, years					0.743
0 to <1	1134 (26.7%)	345 (19.8%)	789 (31.4%)	715 (31.6%)	74 (30.2%)
1 to <5	792 (18.6%)	269 (15.4%)	522 (20.8%)	471 (20.8%)	51 (20.8%)
5 to <10	478 (11.2%)	161 (9.2%)	318 (12.7%)	286 (12.6%)	32 (13.1%)
10 to <15	767 (18.0%)	301 (17.3%)	468 (18.7%)	427 (18.9%)	41 (16.7%)
15 to <22	1082 (25.4%)	668 (38.3%)	412 (16.4%)	365 (16.1%)	47 (19.2%)
Severity Measures					
UNOS Status (at registration)					0.245
1a	2728 (64.1%)	997 (57.2%)	1731 (69.0%)	1549 (68.4%)	182 (74.3%)

	UNOS Population at PHIS-contributing Institutions			p-value ^a
	Total UNOS Population	UNOS Population at Non-PHIS Institutions	UNOS Population at PHIS-contributing Institutions	
1b	643 (15.1%)	329 (18.9%)	314 (12.5%)	29 (11.8%)
2	816 (19.2%)	387 (22.1%)	429 (17.1%)	33 (13.5%)
UNOS Status (at transplant)				0.143
1a	3445 (81.0%)	1315 (75.4%)	2130 (84.9%)	218 (89.0%)
1b	512 (12.0%)	246 (14.1%)	266 (10.6%)	19 (7.8%)
2	296 (7.0%)	183 (10.5%)	113 (4.5%)	8 (3.3%)
Waitlist time, days				0.209
0 to 16	1033 (24.3%)	403 (23.1%)	630 (25.1%)	50 (20.4%)
17 to 45	1014 (23.8%)	392 (22.5%)	622 (24.8%)	59 (24.1%)
46 to 103	1029 (24.2%)	398 (22.8%)	631 (25.1%)	72 (29.4%)
>103	1177 (27.7%)	551 (31.6%)	626 (25.0%)	64 (26.1%)
Mechanical Support - at transplant				0.454
Yes	2895 (68.1%)	1174 (67.3%)	1721 (68.6%)	201 (82.0%)
No	1358 (31.9%)	570 (32.7%)	788 (31.4%)	44 (27.9%)
Center Volume (based on mean number of transplants per year) ^b				0.127
Low (<6.4)	1321 (31.1%)	1180 (67.7%)	138 (5.5%)	17 (6.9%)
Medium (6.4–12.7)	1731 (40.7%)	400 (22.9%)	1332 (53.1%)	140 (57.1%)
High (>12.7)	1201 (28.2%)	164 (9.4)	1039 (41.4%)	88 (35.9%)

^a p-value for the comparison of merged and unmerged patients

Table 2**Crude and Adjusted Comparisons of 30-Day Post-Transplant Mortality**

	30 Day Mortality		
	Rate, n (%)	Crude RR (95% CI)	Adjusted RR (95% CI)
Overall	73 (3.2%)	N/A	
Characteristic			
Sex			
Female	34 (3.3%)	1 (ref)	
Male	39 (3.1%)	0.94 (0.60, 1.48)	
Race			
White	46 (3.6%)	1 (ref)	
Black	9 (2.1%)	1.74 (0.76, 3.96)	
Asian	6 (6.3%)	0.58 (0.29, 1.17)	
Hispanic	10 (2.5%)	0.71 (0.36, 1.39)	
Other	2 (3%)	0.83 (0.21, 3.34)	
Insurance status			
Public	30 (2.8%)	0.76 (0.48, 1.21)	
Private	41 (3.7%)	1 (ref)	
Other	2 (3.1%)	0.84 (0.21, 3.40)	
Age at transplant, year			
0 to <1	35 (4.9%)	2.88 (1.35, 6.16)	2.15 (0.96, 4.85)
1 to <5	8 (1.7%)	1 (ref)	1 (ref)
5 to <10	10 (3.5%)	2.06 (0.82, 5.16)	1.93 (0.73, 5.06)
10 to <15	8 (1.9%)	1.10 (0.42, 2.91)	1.03 (0.38, 2.81)
15 to <21	12 (3.3%)	1.94 (0.80, 4.69)	2.00 (0.81, 4.99)
Indication for Transplant			
Congenital	58 (5.5%)	4.31 (2.46, 7.55)	3.63 (1.90, 6.97)
Myopathy	15 (1.3%)	1 (ref)	1 (ref)
Severity Measure			
UNOS Status (at registration)			
1a	52 (3.4%)	0.78 (0.46, 1.34)	
1b	4 (1.4%)	0.18 (0.11, 0.96)	
2	17 (4.3%)	1 (ref)	
UNOS Status (at transplant)			
1a	67 (3.5%)	1.23 (0.39, 3.83)	
1b	3 (1.2%)	0.43 (0.09, 2.07)	
2	3 (2.9%)	1 (ref)	
Waitlist time, median (range)			
0–16	27 (4.7%)	2.89 (1.37, 6.09)	1.63 (0.74, 3.61)
17–45	13 (2.3%)	1.43 (0.62, 3.33)	1.05 (0.43, 2.55)
46–103	9 (1.6%)	1 (ref)	1 (ref)
>103	24 (4.3%)	2.65 (1.24, 5.66)	3.07 (1.38, 6.83)

30 Day Mortality			
	Rate, n (%)	Crude RR (95% CI)	Adjusted RR (95% CI)
Mechanical Support at Transplant			
Yes	62 (4.1%)	2.76 (1.46, 5.21)	
No	11 (1.5%)	1 (ref)	
ECMO at transplant			
Yes	25 (18.4%)	8.15 (5.19, 12.80)	4.59 (2.52, 8.36)
No	48 (2.3%)	1 (ref)	1 (ref)
Bilirubin			
Quartile 1	3 (0.6%)	1 (ref)	1 (ref)
Quartile 2	7 (1.5%)	2.56 (0.67, 9.86)	2.23 (0.55, 9.06)
Quartile 3	20 (3.1%)	5.33 (1.59, 17.85)	4.97 (1.45, 17.04)
Quartile 4	42 (7.5%)	12.85 (4.01, 41.19)	8.85 (2.67, 29.33)
Dialysis prior to transplant			
Yes	10 (14.7%)	5.30 (2.84, 9.90)	2.68 (1.30, 5.50)
No	60 (2.8%)	1 (ref)	1 (ref)
Gender Match			
Yes	38 (3.2%)	1.03 (0.65, 1.61)	
No	35 (3.3%)	1 (ref)	
Weight Ratio			
Quartile 1	15 (2.7%)	1 (ref)	
Quartile 2	19 (3.3%)	1.21 (0.62, 2.35)	
Quartile 3	15 (2.9%)	1.06 (0.53, 2.12)	
Quartile 4	23 (4.0%)	1.47 (0.77, 2.78)	
Center Volume			
Low	3 (2.5%)	0.73 (0.23, 2.32)	
Medium	33 (3.1%)	0.92 (0.58, 1.44)	
High	37 (3.4%)	1 (ref)	

Center volume was computed as the number of transplants in the previous 5 years before their transplant and categorized as low, medium and high based on cut points at the 25th and 75th percentiles.

Table 3

Crude and Adjusted Comparisons of 1-Year Post-Transplant Mortality

	1 Year Mortality		
	Rate, n (%)	Crude RR (95% CI)	Adjusted RR (95% CI)
Overall	203 (9.0%)	N/A	
Characteristic			
Sex			
Female	92 (9.0%)	1 (ref)	
Male	111 (8.9%)	0.99 (0.76, 1.29)	
Race			
White	121 (9.5%)	1 (ref)	
Black	36 (8.4%)	0.88 (0.62, 1.26)	
Asian	8 (8.3%)	0.88 (0.44, 1.74)	
Hispanic	31 (7.9%)	0.83 (0.57, 1.21)	
Other	7 (10.5%)	1.10 (0.54, 2.27)	
Insurance status			
Public	98 (9.1%)	0.99 (0.76, 1.29)	
Private	103 (9.2%)	1 (ref)	
Other	2 (3.1%)	0.33 (0.08, 1.33)	
Age at transplant, years			
0 to <1	102 (14.3%)	1.87 (1.30, 2.68)	1.51 (1.03, 2.20)
1 to <5	36 (7.6%)	1 (ref)	1 (ref)
5 to <10	14 (4.9%)	0.64 (0.35, 1.17)	0.62 (0.34, 1.14)
10 to <15	24 (5.6%)	0.74 (0.45, 1.21)	0.80 (0.49, 1.32)
15 to <21	27 (7.4%)	0.97 (0.60, 1.56)	1.10 (0.68, 1.77)
Indication for Transplant			
Congenital	156 (14.6%)	3.70 (2.70, 5.07)	3.09 (2.22, 4.31)
Myopathy	47 (3.9%)	1 (ref)	1 (ref)
Severity Measure			
UNOS Status (at registration)			
1a	144 (9.3%)	1.05 (0.74, 1.50)	
1b	21 (7.4%)	0.83 (0.50, 1.40)	
2	35 (8.8%)	1 (ref)	
UNOS Status (at transplant)			
1a	180 (9.4%)	1.41 (0.68, 2.93)	
1b	16 (6.5%)	0.97 (0.41, 2.29)	
2	7 (6.7%)	1 (ref)	
Waitlist time, median (range)			
0–16	69 (11.9%)	1.71 (1.17, 2.48)	1.35 (0.91, 2.00)
17–45	40 (7.1%)	1.02 (0.67, 1.56)	0.96 (0.63, 1.48)
46–103	39 (7.0%)	1 (ref)	1 (ref)
>103	55 (9.8%)	1.40 (0.95, 2.08)	1.67 (1.11, 2.49)

1 Year Mortality			
	Rate, n (%)	Crude RR (95% CI)	Adjusted RR (95% CI)
Mechanical Support at Transplant			
Yes	159 (10.5%)	1.77 (1.28, 2.44)	
No	44 (5.9%)	1 (ref)	
ECMO at transplant			
Yes	46 (33.8%)	4.58 (3.47, 6.06)	2.81 (1.97, 4.02)
No	157 (7.4%)	1 (ref)	1 (ref)
Bilirubin			
Quartile 1	39 (7.6%)	1 (ref)	1 (ref)
Quartile 2	25 (5.4%)	0.70 (0.43, 1.15)	0.76 (0.47, 1.24)
Quartile 3	56 (8.8%)	1.15 (0.78, 1.70)	1.21 (0.81, 1.80)
Quartile 4	81 (14.5%)	1.91 (1.33, 2.74)	1.59 (1.09, 2.34)
Dialysis prior to transplant			
Yes	15 (22.1%)	2.61 (1.63, 4.16)	1.74 (1.04, 2.92)
No	183 (8.5%)	1 (ref)	1 (ref)
Gender Match			
Yes	107 (9.0%)	1.00 (0.77, 1.30)	
No	96 (9.0%)	1 (ref)	
Weight Ratio			
Quartile 1	54 (9.8%)	1 (ref)	
Quartile 2	56 (9.7%)	0.99 (0.69, 1.41)	
Quartile 3	45 (8.1%)	0.83 (0.57, 1.21)	
Quartile 4	48 (8.3%)	0.85 (0.59, 1.23)	
Center Volume			
Low	9 (7.4%)	0.76 (0.40, 1.47)	
Medium	88 (8.3%)	0.85 (0.65, 1.12)	
High	106 (9.8%)	1 (ref)	

* Center volume was computed as the number of transplants in the previous 5 years before their transplant and categorized as low, medium and high based on cut points at the 25th and 75th percentiles.

Table 4

Total PHIS Adjusted Inpatient Costs during the 30-Day Post-Transplant Follow-up Period

	Median	Interquartile Range
Overall	\$254,530	(176,642–346,451)
Sex		
Female	\$254,495	(174,860–340,160)
Male	\$254,559	(178,077–351,516)
Race		
White	\$255,614	(178,827–351,814)
Black	\$252,583	(174,407–352,571)
Asian	\$214,943	(134,992–323,267)
Hispanic	\$255,680	(179,596–327,315)
Other	\$276,918	(196,092–382,758)
Insurance status		
Public	\$264,619	(185,471–355,148)
Private	\$250,192	(174,525–342,051)
Other	\$148,100	(106,818–239,334)
Age at transplant, year		
0 to <1	\$279,029	(196,891–384,076)
1 to <5	\$241,612	(169,296–326,437)
5 to <10	\$259,758	(168,702–362,048)
10 to <15	\$237,009	(170,295–321,420)
15 to <21	\$221,861	(157,323–325,865)
Indication for Transplant		
Congenital	\$286,956	(199,869–397,436)
Myopathy	\$226,944	(156,071–309,472)
UNOS Status (at transplant)		
1a	\$260,468	(180,448–355,828)
1b	\$230,158	(158,181–299,188)
2	\$228,369	(138,194–299,931)
Waitlist time, median (range)		
0–16 days	\$253,464	(174,819–361,967)
17–45 days	\$245,857	(170,295–332,798)
46–103 days	\$266,941	(180,144–353,127)
>103 days	\$248,437	(184,562–335,115)
Mechanical Support at Transplant		
Yes	\$264,859	(182,044–364,859)
No	\$236,701	(163,043–311,866)
ECMO at transplant		
Yes	\$372,631	(244,192–536,710)
No	\$250,459	(172,575–336,618)
Vital Status at 30 Days Post-Transplant		

	Median	Interquartile Range
Alive	\$252,555	(175,181–341,029)
Deceased	\$342,838	(210,478–500,202)

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