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# Burden of Early Hospitalization after Simultaneous Liver-Kidney Transplantation: Results from the US Multicenter SLKT Consortium

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**Short title**: Early hospitalization after SLKT

**Footnotes:**

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**Abbreviations:**

| | |
|---|---|
| Acute Kidney Injury | AKI |
| Body Mass Index | BMI |
| Chronic kidney disease | CKD |
| Cold Ischemia Time | CIT |
| Delayed graft function | DGF |
| End stage renal disease | ESRD |
| Estimated glomerular filtration rate | eGFR |
| Hazard Ratio | HR |
| Interquartile range | IQR |
| Liver Transplantation | LT |
| Model for end stage liver disease | MELD |
| Nonalcoholic fatty liver disease | NAFLD |
| Organ Procurement and Transplantation Network | OPTN |
| Renal Replacement Therapy | RRT |
| Simultaneous Liver-Kidney Transplant | SLKT |
| United Network for Organ Sharing | UNOS |
| Warm Ischemia Time | WIT |

Abstract:

The burden of early hospitalization (within 6 months) following simultaneous liver-kidney transplant (SLKT) is not known. We examined risk factors associated with early hospitalization after SLKT and their impact on patient mortality conditional of six-month survival.

Methods: We used data from the United States (US) Multicenter SLKT Consortium cohort study of all adult SLKT recipients between 2002-2017 who were discharged alive following SLKT. We used Poisson regression to model rates of early hospitalizations after SLKT. Cox regression was used to identify risk factors associated with mortality conditional upon survival at 6 months after SLKT.

Results: Median age (N=549) was 58 years (51-64) with 63% males and 76% Whites; 33% had hepatitis C, 20% NAFLD, 23% alcohol-related liver disease, and 24% other etiologies. Median body mass index (BMI) and model for end stage liver disease with sodium (MELD-Na) were 27 kg/m2 (24-32) and 28 (23-34), respectively. Two-thirds of the cohort had at least one hospitalization within the first 6 months of SLKT. Age, race, hospitalization at SLKT, diabetes, BMI and discharge to subacute rehabilitation facility (SAR) after SLKT were independently associated with high incidence rate ratio of early hospitalization. Number of hospitalizations within the first 6 months did not affect conditional survival.

Conclusions: Early hospitalizations after SLKT were very common but did not affect conditional survival. Although most of the risk factors for early hospitalization were non-modifiable, discharge to SAR after initial SLKT was associated with significant higher incidence rate of early hospitalization. Efforts and resources should be focused on identifying SLKT recipients at high risk for early hospitalization to optimize their predischarge care, discharge planning and long-term follow-up.

**Introduction:**

Simultaneous liver-kidney transplantation (SLKT) incidence has risen significantly since the inception of MELD-based allocation[1-3]. As nonalcoholic fatty liver disease (NAFLD) has become one of the leading indications for liver transplantation (LT) with the rise of the obesity epidemic, this has further driven an increase in SLKT because of concomitant advanced chronic kidney disease in these patients [1,4]. A recent study from the United States Multicenter SLKT Consortium showed that compared with calendar year 2002, SLKT recipients in 2017 were older by 7 years and more likely to have chronic kidney disease[5]. While the 1-year post-SLKT survival has improved over time, 16% will have stage 4-5 CKD by 5-years following SLKT. [5,6]

Early hospitalizations after solid organ transplant affect patient survival, increase morbidity, high costs and negatively impact quality of life and other patient-related outcomes. [7-9] [10] Limiting readmissions from many medical conditions [11,12] and surgical procedures[12] is considered a benchmark of quality in healthcare. Although deceased donor organ transplantation is not included in this category, early hospitalization affect 1- and 3-year patient and graft survival and may indirectly affect the program-specific reports (PSR)- a metric of transplant center performance.[13]

The 30-day readmission rate after kidney transplant is substantial and reported to be 32% in the United States. [8,14,15] One study that used linked data from the Scientific Registry of Transplant Recipients and Centers from Medicare and Medicaid Services found that 58% had at least one hospitalization in the first 6 months after discharge from

the index LT hospitalization[10]. However, no studies to date have examined the incidence and risk factors of early hospitalization among SLKT recipients creating a significant knowledge gap in the understanding of early hospitalizations after SLKT.

Therefore, we examined the incidence and risk factors associated with early hospitalization after SLKT. Furthermore, we evaluated the impact of early hospitalization on patient mortality conditional of six-month survival.

**Methods and Patients:**

**Patients and data collection:**

The US-Multicenter SLKT-C (Figure 1) [5,6] includes candidate, donor, and recipient data on all adult (≥18 years) recipients of SLKT performed at six large US centers (Columbia University Irving Medical Center; Duke University; Northwestern University; University of California, San Francisco; Michigan Medicine, University of Michigan; University of Washington) in six different United Network of Organ Sharing (UNOS) regions between February 2002 to June 2017 as described previously.[5,6] The current study included the SLKT recipients who were discharged alive after their index transplant hospitalization. Since the practices and SLKT policies changed over the span of 15 years, we divided the time period as Era 1 (2002-2008; first consensus conference in 2008[16]) Era 2 (2009-2012; OPTN policy was instituted in 2009) and Era 3(2012-2017; second consensus conference resulted in changes in sustained AKI definitions[17]) as described previously.[5]

Each center provided the counts of hospitalization (between discharge from the index hospitalization and 6 months of SLKT, 6-12 months of SLKT and >12 months of LT) and causes of hospitalization based upon the discharge diagnosis. Since the aim of the study was to examine the burden of early hospitalization, we focused on hospitalization within first 6 months of SLKT. Within first 6 months, we further collected the counts of episodes of hospitalizations between discharge from index SLKT and 30 days, 31-90 days, 91-180 days.

The reasons for early hospitalization were divided into broad categories apriori: infection (any positive, blood culture, urine culture or pneumonia), kidney- related (kidney allograft related such as acute kidney injury, electrolyte imbalance, renal replacement therapy), liver-related (liver allograft related such as biliary or vascular complications), biopsy proven rejection (liver and kidney), cardiovascular (acute coronary syndrome, arrhythmia, congestive heart failure, stroke and peripheral vascular disease) and others (all other reasons that did not fit any of these categories).

The study was approved by each participating center's institutional review boards and data use agreements were established. De-identified coded data were uploaded in the Research Electronic Data Capture (REDCap) at the University of Michigan, the data coordinating center for this consortium.

**Immunosuppression:**

The immunosuppression protocols among all six centers were similar and used tacrolimus-based immunosuppression with mycophenolic acid and corticosteroids as

described previously. Northwestern University revised their immunosuppression protocol in April 2015 and included induction with basiliximab on day 0 and 2 in addition to solumedrol, and a maintenance phase with tacrolimus, mycophenolic acid, with a corticosteroid taper to 5 mg indefinitely. In all other centers, immunosuppression protocols for SKLT were similar to the kidney transplant alone immunosuppression protocol. Induction with thymoglobulin, basiliximab and dacluzimab was based on the presence of panel reactive antibodies and sensitization. The therapeutic tacrolimus trough levels in all the centers were similar and based on days after SLKT. The levels were maintained between 8-12 ng/ml in the first 90 days among all the centers.[6]

**Analytic Approach:**

The primary outcome was number of hospitalizations within 6 months of SLKT. The secondary outcome was mortality conditional upon survival at 6 months after SLKT. The continuous variables were expressed as median (interquartile range) and the categorical variables were expressed as percentages. The MELD-Na score was calculated using the OPTN calculator. The renal risk index (RRI) score[18] was calculated using the RRI calculator. Kidney Donor Profile Index (KDPI),[19] an important factor in deceased donor kidney allocation, went into effect on December 4th, 2014, with the implementation of new kidney allocation system. Hence, all the components of Kidney Donor Profile Index (KDPI) were not available on patients transplanted before 2012. Therefore, we use the kidney donor age as a covariate for donor quality in the main models as described previously.[6] In a sub-analysis, we fitted two separate models to

explore the association between 1) KDPI and hospitalization at 6 months (univariate logistic model) and 2) KDPI and overall mortality (univariate Cox model).

We chose Poisson regression to examine incidence rate ratios of various recipient and donor factors that would affect the incidence of early hospitalization because the data structure had only the counts of hospitalization in first 6 months and dates of hospitalizations were not available. The Poisson regression coefficient is a difference between the logs of expected counts to incidence rate ratios. The incidence rate ratio was computed by exponentiating the Poisson regression coefficient. This model was apriori adjusted for age, race, sex, etiology of liver disease, location at time of SLKT (ambulatory, hospital floor, ICU), SLKT era, pre-LT dialysis, body mass index (BMI), hypertension (HTN), diabetes (DM), MELD-Na, RRI, induction, kidney delayed graft function (KDGF), cold ischemia (CIT), warm ischemia time (WIT), donor age and center. We forced the center in the final adjusted Poisson model to examine the unmeasured center effect.

We examined the cumulative probability of survival at 6 months after SLKT using Kaplan-Meier analysis. Next, we performed the survival analysis conditional on being alive at 6 months after SLKT. The time of entry in the cohort is at 6 months after SLKT to end of follow up period. We also presented a Kaplan Meier survival curve to show the overall cumulative probability of survival. This was stratified by number of hospitalizations within 6 months of SLKT conditional upon being alive at 6 months after SLKT. Cox regression stratified by centers was used to identify risk factors associated with mortality. The focus in this model was the impact of the early (i.e., first 6 months following SLKT) hospitalization on subsequent conditional survival (i.e., given survival of

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the patient through the "early" post-SLKT period). This model was adjusted for the baseline covariates that showed significance (p<0.05) on univariate analysis. The results were presented as hazard ratio and 95% confidence interval.

All analyses were performed in SAS 9.4.

**Results:**

**Patient characteristics:**

The baseline characteristics of the cohort (N=549) are shown in Table 1. Briefly, the median age at the time of SLKT was 58 years (51-64) with 63% males and 76% Whites. Hepatitis C was the leading diagnosis (33%) followed by alcohol-related liver disease (23%) and NAFLD (20%). The median BMI and MELD-Na were 27 kg/m2 (24-32) and 28 (23-34), respectively. Hypertension and diabetes were prevalent in 54% and 42%, respectively. Thirty-one percent of patients were discharged to subacute rehab (SAR) following SLKT index hospitalization.

The median donor age was 36 years (23-48); 93% were donation after brain death and cerebrovascular disease or head injury was the most common cause of death (68%) followed by anoxia or asphyxiation (20%). Donor biopsy data was not available at all centers.

Ninety five percent of SLKT recipients were on tacrolimus, 82% were on triple immunosuppression (calcineurin inhibitors, mycophenolate, and corticosteroids) and only 3% were on calcineurin inhibitor monotherapy at the time of index SLKT

hospitalization discharge. One fourth (24%) of the patients received induction therapy after SLKT and of those who received induction therapy, 74% received basiliximab, 18% received thymoglobulin, and 7% received dacluzimab as induction therapy.

One hundred and thirty-three (23%) patients developed kidney delayed graft function (DGF) requiring renal replacement therapy (RRT) during transplant hospitalization. The median time spent on RRT for kidney DGF was 13 days (IQR 4-40). Post-SLKT stage 4-5 CKD was higher in patients with DGF vs. without (32% vs. 17%; P<0.001).

**Frequency, causes and predictors of early hospitalization after SLKT:**

There were 803 episodes of hospitalizations within first 6 months of SLKT. Table 2 shows the counts of hospitalization stratified by discharge alive to 30 days, 31-90 days and 91-180 days after SLKT. Approximately 41% of early hospitalizations occurred with first 30 days of SLKT. Sixty eight percent of SLKT recipients had at least one hospitalization within six months of SLKT (Figure 2). Among those who had one hospitalization, two-thirds were within 30-days and rest were between 31-180 days from SLKT. Majority of the recipients and donor factors were similar among those with no, one, two or >2 hospitalizations except for recipient race and proportion of discharge to SAR after index SLKT (Table 1).

The main causes of hospitalization with first 6 months of SLKT were infections (25%), kidney-related (21%), liver-related (17%), rejection (10%), cardiovascular (7%) and others (14%). Within the first six months of SLKT, there were 80 rejection episodes

among 71 SLKT recipients; 36 were kidney rejection and 44 were liver rejection episodes. Of note, 12 patients had both liver and kidney rejection episodes within the first six months of SLKT. Of those SLKT recipients who had 2 or more hospitalizations, 28% were for the similar reasons which included infections, kidney related (AKI, dehydration), liver related (biliary cause) and rejection (liver and kidney).

Table 3 shows the independent associations affecting early hospitalization incidence rate ratios following SLKT. Younger age, admitted to hospital in a non-ICU setting (vs. ambulatory status), diabetes, discharge to SAR after SLKT index admission, White race, and BMI<18.5 mg/dl (compared to 25-29) were associated with increased incidence rate ratio for early hospitalization. SLKT era, sex, etiology of liver disease, RRI, donor age, warm and cold ischemia time, MELD at SLKT and kidney DGF did not affect early hospitalization incident rate ratios. Diabetes increased the incidence rate ratio for early hospitalization by 23% by keeping all other variables constant in the model (Table 3). Similarly, discharge to SAR after index SLKT was associated with 24% increase in incidence rate ratio independent of all other variables in the model (Table 3).

Figure 3 shows the cumulative probability of survival at 6 months in these patients. The 6-month cumulative survival was >95%.

**Conditional survival after 6 months of SLKT:**

Figures 4 and 5 show the overall cumulative survival and stratified by number of hospitalization conditional upon alive at 6 months from SLKT. The one-year overall conditional survival was >95% (Figure 4). The cumulative survival stratified by number of hospitalizations was not significantly different (P=0.59) (Figure 5).

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Race, etiology of liver disease, era of SLKT, hypertension, diabetes, discharge location from the index hospitalization and warm ischemia time were significant (P<0.5) on univariate analysis. On multivariable analysis, the independent predictors of death conditional upon 6-month survival included NAFLD compared to other than alcohol and hepatitis C as etiology of liver disease (HR=1.81 [1.09-3.02]; p=0.02), receipt of SLKT after 2012 compared to between 2002-2008 (HR=1.87 [1.02-3.43], P=0.04), warm ischemia time of liver (HR=1.01[1.00-1.01], p<0.001). Number of hospitalizations within first 6 months did not affect survival after 6 months of SLKT (p=0.35).

**KDPI Sub analysis:**

The KDPI information was available in 176 SLKT recipients who were discharged alive after the index SLT hospitalization. The median KDPI was 32 (IQR: 15-57). There was no association between 1) KDPI and odds of hospitalization at 6 months (OR=1.00, P=0.95) and 2) KDPI and overall mortality (HR=1, P=0.9).

**Discussion:**

With increased incidence of SLKT over time, it is essential to rigorously evaluate what factors influence healthcare utilization and outcomes with dual organ transplantation, particularly given the known high costs of SLKT and donor organ scarcity.[7] There is a significant knowledge gap in the understanding of epidemiology of early hospitalizations after SLKT because of lack of data. This is the first study to investigate the contribution of recipients' and donor factors on incidence rate ratio of

early hospitalizations following SLKT, and whether magnitude of early hospitalization impacts mortality.

Various studies suggest that the 30-day hospitalizations among kidney transplant alone is 30-32%[8,14,15] and 30-, 90-day hospitalization in LT alone recipients is around 31-45%.[20-23] We found that the early hospitalizations after SLKT more frequent than the early hospitalization among LT alone patients [10] and kidney transplant recipients. Despite frequent early hospitalizations, the 6-month survival as well as overall survival conditional on alive at 6 months after SLKT was excellent.

In 2020, average total costs associated with LT procedures were $878,400. These costs were distributed across 30-day pre-transplant procedures, procurement, hospital transplant admission, physician, procedural costs, 180-day post-transplant admission, and immuno-suppressant charges[7]. The parallel cost for simultaneous liver-kidney transplant (SLKT) was steeper (>$1.3 million). [7] Notably, the 180-day post-transplant discharge cost for SLKT is about $100,000 higher than for LT alone and $150,000 higher than for kidney transplant alone[7]. The difference in 180-day post-transplant discharge cost for SLKT is likely related to the increased resource utilization following SLKT.

In our multicenter analysis, we did not have the more robust frailty measures such as liver frailty index given the retrospective nature of our data. However, our study identified two key risk factors for early hospitalization included low BMI (<18.5 mg/dl) and need for SAR after index SLKT hospitalization.  Hence medical optimization with regards to malnutrition, sarcopenia, and frailty are likely important to limit early hospitalizations. Prior studies have shown that muscle wasting, and malnutrition are

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poor prognosticators for patients with cirrhosis that impact outcomes independent of MELD[24,25]. Frailty is also associated with increased post-SLKT mortality, liver and kidney graft losses, and hospital length of stay at index admission.[26] As such, methods to boost pre-SLKT nutritional status including utilizing tube feeds and pre-habilitation measures may have important impact for improving post-SLKT early hospitalization risk.

Our study found that diabetes impacted the rate ratio of early hospitalization after SLKT, as seen in LT alone patients.[10] Though we did not capture degree of diabetes control with our study, it is plausible that lack of glycemic control can increase risk of early hospitalization given its impact on wound healing and infection risk.

Since Black patients are at higher risk for early hospitalization after kidney transplant alone, we were expecting the similar results in our SLKT cohort. Instead, our study demonstrated lower incidence rate ratio for Black patients and patients of other races compared to White patients. The phenotypic and functional characteristics of the circulating blood cells of the SLKT recipients resembled those of solitary liver transplant recipients and appear to be associated with donor-specific hypo-alloresponsiveness[27]. This association needs to be needs to be investigated further to tease out the protective role of race in donor specific hypo-alloresponsiveness among SLKT recipients. We did not find any sex-based differences in early hospitalization rates. Like liver transplant recipients[10], younger age was associated with increased incidence rate ratio. We could not find any inflection point for the age. This association needs to be further examined in subsequent studies.

We, previously, reported 1-year overall survival of 92% in our SLKT cohort.[5] The

6-month survival as well as the overall and 1-year survival conditional upon alive at 6

months post-SLKT were excellent in our cohort despite a significant burden of early

hospitalizations. These findings were contrary to the LT alone recipients in whom early

hospitalizations significantly affected the overall survival conditional upon alive at 6

months post-transplant. [10] This may be related to the nature of hospitalizations after

SLKT compared to LT, as a significant portion (21%) were kidney-related and in part

related to the use renal replacement therapies among SLKT recipients.

Our study also found that SLKT recipients with NAFLD had significantly higher

risk of death compared to other etiologies of liver disease. This effect was independent

of the number of early hospitalizations. A plausible reason could be that patients with

NAFLD may have high comorbidities such as chronic kidney disease and

cardiovascular diseases that may lead to increased mortality[28,29]. Moreover, those who

received SLKT in era 2 had higher risk of death compared to era 1. This era effect was

likely due to increasing age, more comorbidities and NAFLD among SLKT recipients in

the later years.[5]

The limitations of our study include the retrospective design, heterogeneity, and

variability in practices during the long study period across the six centers, resulting in

potential bias due to unmeasured characteristics and patient selection. However, we

adjusted for center to overcome the center level variability. Another shortcoming was

that our data had counts for hospitalization instead of dates of hospitalization. Hence,

we could not report the incidence rates or cumulative probability of hospitalization. To

overcome this limitation, we used Poisson regression which is ideal for counts data and provided us with the incidence rate ratios during a defined interval. We did not have all the components to calculate KDRI before year 2011. We, therefore, used donor age, an important component of KDRI. It is possible that our study may not have fully captured the hospitalizations that occurred in the community following SLKT. However, this is typically very rare in the first 6 months after SLKT because of common policy to direct admissions to the transplant center and transfer patients to the transplant center if admitted elsewhere. Finally, our study lacked the more robust frailty measure such as liver frailty index because of the retrospective nature. However, we used the BMI and discharge to SAR as a surrogate for functional status.

In conclusion, early hospitalizations after SLKT were very common but did not affect conditional survival. Efforts and resources should be focused on identifying SLKT recipients at high risk for early hospitalization to optimize their predischarge care, discharge planning and long-term follow-up. Furthermore, modification of actionable risk factors such as diabetes and BMI may further reduce resource utilization associated with early hospitalizations.

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Figures:

Figure 1: The US Multicenter SLKT Consortium

Figure 2: Percentage of early hospitalization after SLKT

Figure 3: Cumulative probability of survival within 6 months of SLKT

Figure 4: Overall cumulative probability of survival conditional upon being alive at 6 months of SLKT

Figure 5: Overall cumulative probability of survival conditional upon being alive at 6 months of SLKT stratified by number of early hospitalizations

Table 1: Characteristics of SLKT recipients

| Covariates | Total | Number of Early hospitalizations | | | | P-Value |
| --- | --- | --- | --- | --- | --- | --- |
| | | None | One | Two | > Two | |
| N | 549 | 175 | 151 | 100 | 123 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Age | 57.7 (50.6,63.9) | 58.0 (50.7,64.6) | 58.1 (51.0,64.1) | 56.5 (50.7,64.3) | 57.2 (49.7,62.1) | 0.57 |
| Female n(%) | 202 (37) | 66 (38) | 54 (36) | 37 (37) | 45 (37) | 0.99 |
| White Black Others | 417 (76) 68 (12) 64 (12) | 120 (68) 26 (15) 29 (17) | 109 (72) 21 (14) 21 (14) | 78 (78) 12 (12) 10 (10) | 110 (90) 9 (7) 4 (3) | 0.003 |
| MELD at SLKT | 28.0 (23.0,34.0) | 28.0 (22.0,35.0) | 28.0 (23.0 34.0) | 28.0 (24.0,34.5) | 29.0 (22.0,35.0) | 0.47 |
| NAFLD Alcohol Hepatitis C Others | 110 (20) 128 (23) 177 (33) 134 (24) | 26 (15) 48 (27) 57 (33) 44 (25) | 35 (23) 33 (22) 45 (30) 38 (25) | 22 (22) 21 (21) 34 (34) 23 (23) | 27 (22) 26 (21) 41 (33) 29 (24) | 0.74 |
| Ambulatory Floor ICU | 160 (29) 71 (13) 318 (58) | 58 (33) 23 (13) 94 (54) | 51 (34) 19 (13) 81 (54) | 26 (26) 10 (10) 64 (64) | 25 (20) 19 (15) 79 (64) | 0.15 |
| Dialysis at SLKT | 164 (30) | 56 (32) | 50 (33) | 25 (25) | 33 (27) | 0.42 |
| Hypertension | 295 (54) | 87 (50) | 79 (52) | 66 (66) | 63 (51) | 0.055 |
| Diabetes | 229 (42) | 62 (35) | 66 (43) | 44 (44) | 57 (46) | 0.22 |
| BMI | 27.2 (23.6,32.2) | 27.2 (23.7,32.2) | 27.1 (24.7,31.3) | 26.6 (22.5,33.4) | 28.2 (23.2,32.5) | 0.99 |
| RRI | 7.6 (5.3,12.3) | 7.6 (5.4,11.4) | 7.6 (5.2,12.0) | 7.6 (5.1,13.4) | 7.8 (5.5,13.7) | 0.89 |
| Donor age | 36.0 (23.0,48.0) | 36.0 (23.0,48.0) | 36.0 (25.0,34.0) | 37.0 (25.0,47.0) | 33.0 (21.0,49.0) | 0.64 |
| Induction | 129 (24) | 38 (22) | 38 (25) | 21 (21) | 32 (26) | 0.72 |
| Tacrolimus | 521 (95) | 166 (95) | 141 (94) | 96 (96) | 118 (96) | 0.74 |
| Discharge to SAR after SLKT | 172 (31) | 47 (27) | 44 (29) | 29 (29) | 52 (42) | 0.03 |
| Length of stay for index SLKT admission | 19.0 (10.0,33.0) | 20.0 (10.0,33.0) | 18.0 (9.0,34.0) | 19.0 (9.0,36.5) | 19.0 (10.0,39.0) | 0.61 |
| No Kidney DGF | 426 (78) | 130 (75) | 117 (78) | 78 (78) | 101 (82) | 0.47 |

Table 2: Counts of Hospitalization episodes within first 6 months

| Days from SLKT (Episodes of hospitalization=803*) | Number of Early hospitalizations | | |
|---|---|---|---|
| | One | Two | > Two |

|  | N=151** | N=100 | N=123 |
|---|---|---|---|
| Discharge alive from index SLKT -30 days (331) | 92 | 87 | 152 |
| 31-90 days (227) | 28 | 61 | 138 |
| 91-180 days (229) | 27 | 38 | 164 |

Footnote: *Data was not available in 16 episodes of hospitalization to classify into time frames. ** 4 of them were in the one hospitalization group.

Table 3: Independent associations with number of early hospitalizations after SLKT

| Covariates | Estimate (SE) | Incident Rate Ratio (95% CI) | P-value |
|---|---|---|---|

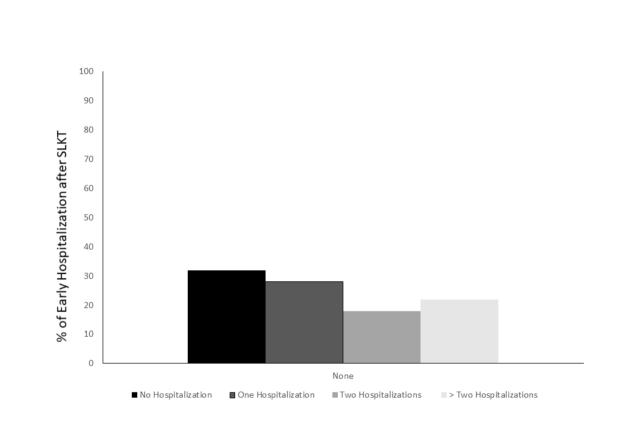| | | | |
|---|---|---|---|
| Age (10 years) | -0.073 (0.0036) | 0.93 (0.90,0.96) | <0.001 |
| Black (ref= White) | -0.38 (0.13) | 0.68 (0.60, 0.78) | 0.004 |
| Other (ref= White) | -0.49 (0.15) | 0.61 (0.53, 0.71) | 0.001 |
| Status at SLKT surgery (ref: Ambulatory) | | | 0.009 |
| Floor | 0.35 (0.14) | 1.42 (1.09,1.85) | 0.23 |
| ICU | 0.18 (0.15) | 1.21(0.89,1.62) | |
| BMI (ref<18.5 kg/m$^2$) | | | |
| 18.5-24 | -0.38 (0.24) | 0.69 (0.43,1,11) | 0.12 |
| 25-29 | -0.55 (0.25) | 0.58 (0.36,0.94) | 0.03 |
| ≥ 30 | -0.36 (0.25) | 0.70 (0.43,1.13) | 0.15 |
| Diabetes (ref=No) | 0.20 (0.086) | 1.23 (1.03,1.45) | 0.02 |
| Discharge to SAR from index SLKT (ref=home) | 0.22 (0.082) | 1.24 (1.06,1.46) | 0.008 |

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Cumulative survival

Time after SLKT (months)

Number at risk

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| All | 549 | 545 | 540 | 535 | 526 | 523 | 520 |
| Events | 0 | 2 | 3 | 7 | 11 | 12 | 16 |

| | | | | | |
|---|---|---|---|---|---|
| **Number at risk** | | | | | |
| All | 518 | 498 | 455 | 392 | 343 | 298 |
| events | 0 | 13 | 24 | 38 | 50 | 58 |

Number of hospitalizations  + 0  +· 1  ·+· >=2

Cumulative survival

1.00

0.95

0.90

0.85

0.80

p = 0.594

6          12          24          36          48          60

Time after SLKT (months)

Number at risk

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 165 | 162 | 148 | 132 | 119 | 103 |
| 1 | 144 | 141 | 128 | 106 | 91 | 79 |
| >=2 | 209 | 195 | 179 | 154 | 133 | 116 |