

**Abstract Type : Poster**

**Abstract Submission No. : PO-1104**

## **External Validation of the Hennepin Transplant Risk Score for Prediction of Short-term Mortality and Morbidity after Deceased Kidney Transplantation**

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**Objectives:** In recent years, clinicians have been looking for objective scoring systems for providing accurate information on post-transplant outcomes. We tested the applicability of the Hennepin scoring system, which was recently validated in transplant recipients at the listing time in a different transplant center in the United States

**Methods:** A total of 274 deceased kidney transplantation recipients (mean age 51.3±14.9 years, F/M:113/161) transplanted between 2006-2015 were included in this study. In order to use the Hennepin score, age, functional status, cardiovascular co-morbidities, dialysis and diabetes status, were determined at the time of listing. A serious adverse outcome was defined as the presence of any of these events: mortality, graft loss, MI or stroke, ICU stay greater than 2 weeks, readmission requiring ICU admission, or care at a long-term care facility greater than 2 months (within the first year post transplant). Patients were stratified into 4 risk groups based on score (Table 1).

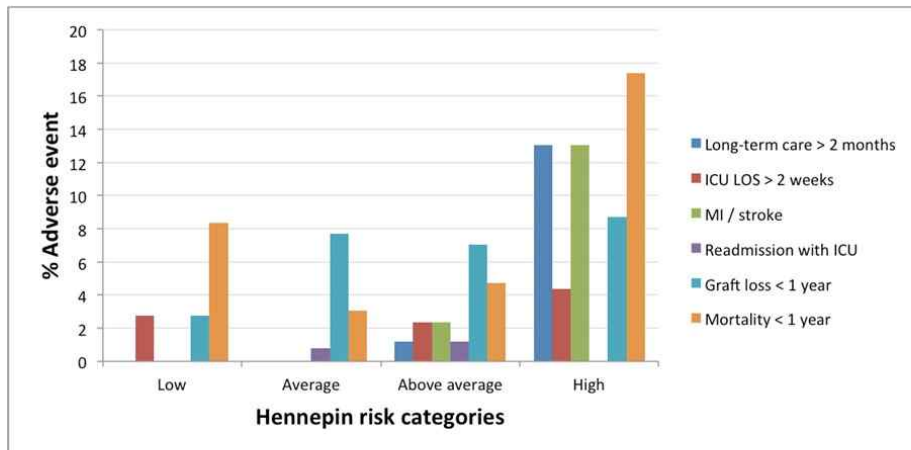
**Results:** Fifteen deaths and 19 graft losses were observed in the first year following transplantation. A total of 49 events occurred in 43 patients. The incidence of severe adverse events 1 year post-transplant was 17.8 %. While only 8% of patients were stratified into the high risk group they accounted for 28% of the severe adverse outcomes, a patient in this group having a > 50% chance of a severe adverse outcome (Figure 1). The Hennepin transplant risk score showed moderately good discrimination for severe adverse events (c- statistics:0.648).

**Conclusions:** These results provide external validation of the Hennepin score as a moderately good tool for discriminating short-term post-transplant morbidity for kidney transplantation recipients. The major advantage of this scoring is predicting the outcome at the listing time and providing a time for correction of pre-existing co-morbidities before transplantation.

Table 1. Generation of Hennepin Transplant Risk Score

| Variables                               | Points                    |
|---|---------------------------|
| <b>Age</b>                              |                           |
| Age <65                                 | 0                         |
| Age ≥ 65                                | 1                         |
| <b>Functional status (Karnofsky)</b>    |                           |
| 100                                     | 0                         |
| 90                                      | 1                         |
| 80                                      | 2                         |
| 70                                      | 3                         |
| <b>Cardiovascular diseases (Number)</b> |                           |
| 0                                       | 0                         |
| 1                                       | 1                         |
| 2                                       | 2                         |
| 3                                       | 3                         |
| 4 or > 4                                | 4                         |
| <b>Diabetes and Dialysis status</b>     |                           |
| Predialysis                             | 0                         |
| Dialysis                                | 1                         |
| Diabetes                                | 2                         |
| Diabetes and <4 years on dialysis       | 3                         |
| Diabetes and +4 years on dialysis       | 4                         |
| <b>Total score</b>                      | (.../12)<br>Sum of points |

Figure 1. Risk Stratification of Study Cohort for Hennepin transplant risk score and EPTS



| Hennepin Risk Score Group | Composite outcome |             |           |             |            |              |
|---------------------------|-------------------|-------------|-----------|-------------|------------|--------------|
|                           | No                |             | Yes       |             | Total      |              |
|                           | N                 | %           | N         | %           | N          | %            |
| Low risk                  | 32                | 88.9        | 4         | 11.1        | 36         | 100.0        |
| Average risk              | 116               | 89.2        | 14        | 10.8        | 130        | 100.0        |
| Above average risk        | 72                | 84.7        | 13        | 15.3        | 85         | 100.0        |
| High risk                 | 11                | 47.8        | 12        | 52.2        | 23         | 100.0        |
| <b>Total</b>              | <b>231</b>        | <b>84.3</b> | <b>43</b> | <b>15.7</b> | <b>274</b> | <b>100.0</b> |