**Incidence and Associated Outcomes of Acute Circulatory Support Prior to Heart Transplantation**

Background: Recent proposed changes to the United Network for Organ Sharing (UNOS) allocation protocol prioritizes patients with acute circulatory support including veno-arterial extracorporeal membrane oxygenation (ECMO), percutaneous ventricular assist devices (PVAD), and intra-aortic balloon pump (IABP). We sought to evaluate contemporary trends in the incidence and associated outcomes of acute circulatory support during the hospitalization prior to orthotopic heart transplantation (OHT).

Methods: Using data from the Nationwide Inpatient Sample (NIS) from 1998 to 2011, we identified patients who underwent orthotopic heart transplant (OHT) and further identified whether the patient also underwent ECMO, PVAD, or IABP. We calculated in hospital mortality for those patients who underwent OHT based on each subgroup adjusting for age, sex, race, household income, and number of comorbid diagnoses.

Results: We identified 5,381 patients who underwent heart transplantation from 1998 to 2011, of which 586 (10.9%) was also supported by IABP, 110 (2.0%) was supported by PVAD, and 102 (1.9%) was supported by pre-transplantation ECMO. The rate of in-hospital mortality was significantly higher in patients with pre-transplant ECMO (11.8%), PVAD (14.5%), and IABP (18.1%) compared to patients without such acute circulatory support (4.1%).

Conclusions: In our cohort, pre-transplant acute circulatory support with IABP, PVAD, or ECMO represents a small subset of patients who eventually undergo heart transplantation. These patients have increased in-hospital mortality, consistent with their increased <AGE, and number of comorbidities> With changes to the UNOS allocation protocol, further study of acute circulatory support prior to transplant should be undertaken.

<https://optn.transplant.hrsa.gov/media/1244/08_adult_heart_allocation_part1.pdf>

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| Table 1. Baseline characteristics of patients who undergo heart transplantation subsetted by the utilization of acute circulatory support | | | | | |
|  | **None** | **IABP** | **PVAD** | **ECMO** | **Total** |
| Length of stay, mean ± SD | 39.3 ± 33.2 | 48.9 ± 25.6 | 85.8 ± 40.1 | 151.2 ± 52.6 | 37.1 ± 34.6 |
| Length of stay after OHT, mean ± SD | 23.8 ± 21.4 | 21.7 ± 15.8 | 27.6 ± 37.1 | 27.1 ± 22.8 | NA |
| Mortality, n (%) | 11 (26.8) | 5 (13.2) | 5 (11.9) | 5 (11.6) | 564 (27.3) |
| Age, mean ± SD | 50.6 ± 12.6 | 48.6 ± 12.7 | 47.4 ± 15.3 | 46.3 ± 13.1 | 55.4 ± 13.2 |
| Sex, n (%) | | | | | |
| Male | 33 (80.5) | 32 (84.2) | 35 (83.3) | 34 (79.1) | 1525 (74.9) |
| Female | 8 (19.5) | 6 (15.8) | 7 (16.7) | 9 (20.9) | 511 (25.1) |
| Race, n (%) | | | | | |
| White | 25 (61.0) | 19 (50.0) | 23 (54.8) | 22 (51.2) | 1185 (58.2) |
| Black | 3 (7.3) | 5 (13.2) | 8 (19.0) | 6 (14.0) | 330 (16.2) |
| Hispanic | 3 (7.3) | 7 (18.4) | 2 (4.8) | 5 (11.6) | 125 (6.1) |
| Asian/Pacific Islander | 2 (4.9) | 0 (0.0) | 1 (2.4) | 4 (9.3) | 44 (2.2) |
| Native American | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 5 (0.2) |
| Other or unknown | 8 (19.5) | 7 (18.4) | 8 (19.0) | 6 (14.0) | 347 (17.0) |
| Median household income, n (%) | | | | | |
| $1-24,999 | 4 (9.8) | 8 (21.1) | 8 (19.0) | 8 (18.6) | 447 (22.0) |
| $25,000-34,999 | 10 (24.4) | 10 (26.3) | 10 (23.8) | 7 (16.3) | 454 (22.3) |
| $35,000-44,999 | 12 (29.3) | 8 (21.1) | 10 (23.8) | 13 (30.2) | 509 (25.0) |
| $45,000 or more | 12 9 (29.3) | 12 (31.6) | 14 (33.3) | 14 (32.6) | 579 (28.4) |
| Unknown | 3 (7.3) | 0 (0.0) | 0 (0.0) | 1 (2.3) | 47 (2.3) |
| Comorbidities | | | | | |
| Diabetes | 8 (19.5) | 5 (13.2) | 4 (9.5) | 2 (4.7) | 373 (18.3) |
| Hyperlipidemia | 5 (12.2) | 2 (5.3) | 3 (7.1) | 3 (7.0) | 297 (14.6) |
| Hypertension | 5 (12.2) | 1 (2.6) | 2 (4.8) | 2 (4.7) | 291 (14.3) |
| History of smoking | 5 (12.2) | 2 (5.3) | 0 (0.0) | 0 (0.0) | 137 (6.7) |
| BMI ≥ 30 kg/m2 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 96 (4.7) |
| Number of comorbid diagnoses, mean ± SD | 11.9 ± 3.1 | 12.3 ± 3.0 | 12.5 ± 3.2 | 12.5 ± 3.2 | 12.8 ± 2.9 |
| Location of hospital, n (%) | | | | | |
| Rural | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 17 (0.8) |
| Urban | 41 (100.0) | 38 (100.0) | 42 (100.0) | 43 (100.0) | 2017 (99.1) |
| Unknown | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2 (0.1) |
| Size of hospital, n (%) | | | | | |
| Small | 4 (9.8) | 0 (0.0) | 0 (0.0) | 2 (4.7) | 32 (1.6) |
| Medium | 7 (17.0) | 6 (15.8) | 5 (11.9) | 0 (0.0) | 211 (10.4) |
| Large | 30 (73.2) | 32 (84.2) | 37 (88.1) | 41 (95.3) | 1791 (88.0) |
| Unknown | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2 (0.1) |
| Teaching status of hospital, n (%) | | | | | |
| Nonteaching | 1 (2.4) | 1 (2.6) | 2 (4.8) | 1 (2.3) | 160 (7.9) |
| Teaching | 40 (97.6) | 37 (97.4) | 40 (95.2) | 42 (97.7) | 1874 (92.0) |
| Unknown | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2 (0.1) |

SD, Standard Deviation; BMI, Body Mass Index; ECMO, extracorporeal membrane oxygenation; PVAD, percutaneous ventricular assist devices; IABP, intra-aortic balloon pump.