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Hospital characteristics associated with increased conversion rates among organ donors in New England

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ABSTRACT

Background: It is unknown whether hospital characteristics affect institutional performance with regard to organ donation. We sought to determine which hospital- and patient-level characteristics are associated with high organ donor conversion rates after brain death (DBD).

Methods: Data were extracted from the regional Organ Procurement Organization (2011–2014) and other sources. Hospitals were stratified into high-conversion hospitals (HCH; upper-tertile) and low-conversion hospitals (LCH; lower-tertile) according to conversion rates. Hospital- and patient-characteristics were compared between groups.

Results: There were 564 potential DBD donors in 27 hospitals. Conversion rates differed between hospitals in different states ($p < 0.001$). HCH were more likely to be small (median bed size 194 vs. 337; $p = 0.024$), non-teaching hospitals (40% vs. 88%; $p = 0.025$), non-trauma center (30% vs. 77%; $p = 0.040$). Potential donors differed between HCH and LCH in race ($p < 0.01$) and mechanism of injury/disease process ($p < 0.01$).

Conclusion: There is significant variation between hospitals in terms of organ donor conversion rates. This suggests that there is a pool of potential donors in large specialized hospitals that are not successfully converted to DBD.

1. Introduction

There are 121,650 Americans currently waiting to undergo organ transplantation.[1] Even though 2015 hit high records with 30,973 transplants,[1] the gap between supply and demand is substantial. It is for this reason that the Organ Procurement and Transplantation Network (OPTN) has identified increasing the number of transplants as the first key goal in their strategic plan.[2] One of the ways to increase the pool of organs available for transplantation is to increase the number of donors after brain death (DBD).[3]

It is important to understand the characteristics of hospitals and patients involved in organ donation in order to inform the design of interventions to increase the available pool of donor organs. A small number of previous studies have explored factors associated with increased organ donation. For instance, it has been suggested that some geographical locations are more likely to have higher

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authorization rates than others.[4–7] Demographic characteristics have also been associated with variations in consent rates: racial/ethnic minorities and older potential donors are less likely to consent,[8] despite the fact that minority patients are over-represented on transplantation waiting lists.[9] Moving beyond individual patient characteristics, there is also evidence that hospital- and system-level factors are associated with organ donation. It has previously been shown that early Organ Procurement Organization (OPO) involvement in the consent process, having organ donor councils within the hospital, and the presence of in-house organ donation coordinators are associated with increased donor numbers.[10–15]

The objective of the present study was to explore associations between hospital- and patient-level characteristics and donor conversion rates after DBD. We hypothesized that there would be systematic differences in institutional characteristics between hospitals with high-performance and low-performance in terms of conversion rates.

2. Methods

2.1. Data sources

Patient-level data from 2011 to 2014 were extracted from the regional organ procurement organization (OPO), which is a federally designated, non-profit organization that coordinates organ and tissue donation in all New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont) and Bermuda. This organization works in collaboration with over 150 hospitals and serves 11 million people in the region. Their staff participate in multiple aspects of donation processes including authorization, maintenance of medical support of potential donors, coordination of organ procurement, allocation of organs according to the national transplant waiting list and organization of organ transportation to transplant centers or tissue processors.[16]

Hospital-level data were extracted from three different sources: (1) the American Hospital Association (AHA) Annual Survey Database (2012), which is a comprehensive repository of over 6300 hospitals in the United States and includes up to 1000 fields of data on organizational structure, facility and services, and geographic indicators[17] (2) the Joint Commission website[18]; which is a not-for-profit organization recognized nationwide that accredits and certifies nearly 21,000 health care organizations and programs in the country; and (3) the regional OPO. Hospital level-data and patient-level data were linked by matching hospital names and geographic location (city and state).

2.2. Study population

Hospitals in New England with at least one DBD/year during the study period were included. The main unit of analysis was set at the hospital-level for hospital characteristics analysis. For processes and patient characteristics analysis, the unit of analysis was individual patients.

2.3. Patient characteristics, process measures and hospital characteristics

Patient-level variables extracted from the regional OPO included age, gender, race, (White, Black, Hispanic, other) and disease process or mechanism of injury. Process measures included authorization rate (previously known as consent rate), first-person authorization rate (potential donors that were registered as donors), proportion of patients approached by OPO staff, appropriate timeliness of referral of potential donors, and reasons for declining authorization (for those whose authorization was not obtained). Hospital-level variables extracted included transplant center designation (from the regional OPO data), stroke center designation (from Joint Commission data), trauma center designation, hospital bed size, teaching status (defined as hosting an Accreditation Council for Graduate Medical Education [ACGME] accredited physician training program *or* as member of the Council of Teaching Hospitals [COTH]), Intensive Care Unit (ICU) services, trauma center self-designation, ownership (for-profit or non-for-profit), urbanicity (defined by Core Based Statistical Area codes corresponding to population $\geq$2.5 million), and state location (from AHA data).

2.4. Outcome measures

The main outcome was donor conversion performance of individual hospitals. Conversion rates were calculated for each hospital (actual DBD donors/potential DBD donors), which were then stratified into high-conversion hospitals (upper tertile) and low-conversion hospitals (lower tertile). Hospitals and patients in the middle tertile were excluded to allow a washout of hospitals characteristics between both groups.

Conversion is measured after a potential donor is identified and a final outcome is available (either the patient becomes a donor or does not.) Conversion can be a product of a conversation guided by OPO staff or hospital staff, though the greatest success has been reached through collaboration between the two. Hospital and OPO staff is held accountable to the donation process as measured by conversion rates. These rates are not measured differently whether the hospital or the OPO conducts the donation conversation with a family.

2.5. Statistical analysis

Hospital- and patient-characteristics were explored using descriptive statistics (frequencies and proportions), Fisher's exact (binary/categorical variables) and Mann-Whitney U (non-normally-distributed continuous variables) tests with a two-sided significance threshold set at $p < 0.05$. All statistical analyses were performed using Stata Statistical Software: Release 13.0. (College Station, TX). Density maps with superimposed pie charts were created to illustrate the number of hospitals included per state and the proportion corresponding to high- and low-conversion hospital groups. All geographic analyses were performed using Tableau 9.2.6 (Seattle, WA). The research protocol was approved by the Partners Human Research Committee.

3. Results

There were 564 (464 in low-conversion and 100 in high-conversion hospitals) patients identified as potential donors at 27 individual hospitals (17 low-conversion and 10 high-conversion) during the study period. All potential donors for whom authorization was obtained were converted into donors, and so the authorization (patients/next-of-kin authorized among those who were eligible) and conversion (actual donors among those who were eligible) rates were equal. The authorization/conversion rate was 85% in the high-conversion group and 55% in the low-conversion group ($p < 0.001$).

3.1. Patient characteristics and process measures

Patients in high- and low-conversion-hospitals did not differ statistically in terms of age (overall median age 46 years old [Interquartile range-IQR-: 27–58]) or sex (overall 56% male) (Table 1). High- and low-conversion-hospitals differed in the