A Standardized Donor Designation Ratio to Assess the Performance of Driver's License Agencies

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ABSTRACT

Evaluating Department of Motor Vehicles (DMV) locations based on the percent of patrons who register as donors does not account for individual characteristics that may influence willingness to donate. We reviewed the driver's licenses of 2997 randomly selected patients at an urban medical system to obtain donor designation, age, gender, and DMV location and linked patient addresses with census tract data on race, ethnicity, income, and education. We then developed a Standardized Donor Designation Ratio (SDDR) (ie, the observed number of donors at each DMV divided by the expected number of donors based on patient demographic characteristics). Overall, 1355 (45%) patients were designated as donors. Donor designation was independently associated with younger age, female gender, nonblack race, and higher income. Across 18 DMVs, the proportion of patients who were donors ranged from 30% to 68% and SDDRs ranged from 0.82 to 1.17. Among the 6 facilities in the lowest tertile by SDDR, 3 were in the lowest tertile by percent donation. In conclusion, there is a great deal of variation across DMVs in rates of organ donor designation. SDDRs that adjust for DMV patron characteristics are distinct measures that may more accurately describe the performance of DMVs in promoting organ donation.

DEPARTMENT of Motor Vehicles (DMV) facilities play a crucial role in organ donation [1,2]. For example, 95% of designated organ donors in Ohio signed up at their local DMV [3]. DMVs are evaluated in part by how many of their patrons register to be organ donors. Organ procurement organizations (OPOs) use this information to decide where to target their efforts. In addition, awards are given to facilities with the highest donor designation rates [4,5]. However, previous research indicates that the characteristics of individuals greatly influence their willingness to donate [6–14]. Failure to account for such characteristics may lead to inaccurate assessments of DMV performance. Accounting for these individual characteristics may allow OPOs to better target truly low-performing DMVs and optimize resource distribution.

We sought to develop a novel method to better assess DMV performance with respect to organ donation.

Specifically, we developed a Standardized Donor Designation Ratio (SDDR) that adjusts for the characteristics of each DMV's patrons. We determined organ donor designation and DMV location from driver's licenses, state identification cards, and learner's permits. We were able to examine these because they are scanned into patient electronic health records at each clinical encounter within a large urban safety net medical system.

METHODS

This study was conducted at an urban safety net medical system in northeast Ohio that includes a large tertiary care hospital and a dozen community centers located in both poor and wealthy communities. We randomly selected 3500 active adult patients (ie, those age ≥18 years who saw their primary care physician at least twice in the preceding 2 years). From electronic health records, we obtained scanned driver's licenses, state identification cards, or learner's permits. Two researchers independently examined these documents to determine each patient's organ donor designation, age, gender, home address, and DMV location. A third researcher resolved any discrepancies between the two researchers. We linked patient addresses with census tract data on percent of tract residents who are black, percent who are Hispanic, average household income, and percent who graduated high school. Census tracts are small subdivisions of a county that average about 4000 inhabitants. This study was approved by the Institutional Review Board of MetroHealth Medical Center, Cleveland, Ohio (approval number 685, protocol number 13-00548).

We used descriptive statistics (percentages, means, and standard deviations) to describe the characteristics of the patients. For each DMV, we calculated the percent of patients who used that facility and were designated as organ donors. We used the χ^2 test to determine the univariate relationship between organ donation status and patient demographic characteristics. We used logistic regression to determine the multivariate relationship between organ donation status and patient characteristics, including age, gender, and census tract variables. We used this multivariate model to calculate the expected probability of donor designation (as opposed to actual donor designation) for each patient after accounting for patient characteristics. For each DMV, we summed the expected probability of donor designation across all patients who used that facility to determine the total expected number of organ donors. We then calculated a SDDR as the observed number of donors at each DMV divided by the expected number of donors. To ensure an adequate sample size, we focused on DMVs that had 30 or more patients. This allowed us to estimate percent donors to within ±15% of the true value with a 90% confidence level [15]. We calculated the coefficient of variation (standard deviation divided by mean) for both the percent of patients who were donors at each DMV and the SDDR. We used the nonparametric Spearman rank correlation coefficient ρ to examine the correlation between ranks based on percent donation and those based on SDDR. Spearman ρ^2 values were used to indicate the amount of variation in ranks by one method that was accounted for by ranks in the other method. P values less than .05 or 95% confidence intervals that excluded 1.00 were considered statistically significant. All statistical analyses were performed using JMP Pro 12.0 (SAS Institute, Cary, NC, United States).

RESULTS

Of 3,500 randomly selected patients, 3095 (88%) had their organ donation status documented on a state driver's license (2301 patients), state identification card (748 patients), or learner's permit (46 patients). We excluded 67 patients with documents from DMVs outside of Ohio. In addition, 31 patient addresses could not be matched to a census tract. This resulted in a final sample of 2997 patients. The demographic characteristics of these patients are in Table 1.

Their mean age was 46.1 years, and most were female patients.

Overall, 1355 (45%) patients were designated as donors on their DMV documents. On univariate analysis, donor designation was associated with a number of patient characteristics (Table 2). For example, 49.9% of patients less than 30 years of age were organ donors compared with 36.9% of patients older than 55 years of age. On multivariate analysis, donor designation was independently associated with younger age, female gender, nonblack race, and higher income. For example, patients younger than 30 years of age had 1.83 times greater odds of donor designation compared with patients 55 years of age or older.

The SDDRs ranged from 0.82 to 1.17 across 18 DMVs, with a coefficient of variation of 9.1% (Table 3). The percent of patients who were donors ranged from 30.4% to 68.2% across DMVs, with a coefficient of variation of 22.0%. DMVs with high SDDRs also tended to have high percent of donors. For example, facility A was the highest-ranked facility for both SDDR and percent donation. However, the rankings of mid- and low-ranking DMVs differed when measured by SDDR or percent donors. For example, facility R was ranked last by SDDR but tenth by percent donors. Facilities M, N, O, P, Q, and R were in the lowest tertile by SDDR. Of these 6 facilities, 3 (50%) were in the lowest tertile by percent donation (facilities N, P, and Q). The correlation between the 2 measures indicated that about half of the variation in SDDR was explainable by percent donors (Spearman $\rho^2 = 0.53$).

DISCUSSION

We found that about half of patients at a large urban safety net medical system were designated as donors on their driver's licenses. This is similar to national figures on the percentage of Americans who are registered as donors [16]. In addition, we found that several demographic characteristics were independently associated with donor designation, including younger age, female gender, nonblack race, and higher income. These findings are generally consistent with previous studies on willingness to donate [9,11,12,17]. More importantly, we found that there is a more than 2-fold

Table 1. Demographic Characteristics of 2997 Patients and Their Census Tracts*

Patient age (y)	46.1 (16.4)
Patient sex	
Female	1785 (60%)
Male	1212 (40%)
Census tract	
Black (%)	33.8 (35.3)
Hispanic (%)	8.4 (11.4)
Household income, 1000$	41.5 (21.7)
Graduated high school (%)	82.8 (11.2)

*Numbers indicate mean (standard deviation) for continuous variables and n (percentage) for categorical variables.