Chapter 4
Geographic Disparity in the United States Heart Allocation System: Current Status and Future Implications

Fatemeh Karami
University of Louisville, USA

Mehdi Nayebpour
George Mason University, USA

Monica Gentili
University of Louisville, USA & University of Salerno, Italy

Naoru Koizumi
George Mason University, USA

Andrew Rivard
Cleveland Clinic, USA

ABSTRACT

Organ allocation for transplantation across the United States is administered by the United Network for Organ Sharing (UNOS). UNOS recently approved a major policy change of the system used to allocate hearts for adult transplant candidates. The main objective of this study is to investigate the impact of the new policy on geographic disparity measured by four performance indicators (waiting time before a transplant, transplant rate, pre-transplant mortality rate, and average distance traveled by donated hearts). The current policy and the new policy were evaluated using the thoracic simulation allocation model. The results show that the new policy improves the median waiting time, transplant rate, and pre-transplant mortality rate. The overall predicted improvement in geographic equity is modest except in terms of waiting time. The findings highlight the need for a targeted approach for donor heart allocation to achieve equal access to heart transplantation in the US.

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INTRODUCTION

Heart failure is a growing health problem affecting over 5 million adults in the United States (Go, 2013). Heart transplantation is the definitive destination therapy with the best favorable outcomes for end-stage (i.e., Stage D) heart disease patients: 1-year survival rate for adult patients who underwent a heart transplant from 2007 through 2009 was 88%, while 3-year and 5-year survival rates were 81% and 75%, respectively (Colvin-Adams, 2014). Without a transplant, the 5-year survival rate is only about 20% (Ammar, 2007).

In the United States, organ allocations for transplantation have been administered by the United Network for Organ Sharing (UNOS). UNOS established the Organ Procurement and Transplantation Network (OPTN) in 1984 to coordinate across 58 Organ Procurement Organizations (OPOs). Each OPO is responsible for acquiring and distributing the organs procured within its service area, which is known as a Donor Service Area (DSA). The 58 OPOs are grouped in 11 UNOS regions. UNOS’s mission is to ensure fair and equitable allocation of organs as stated in the Code of Federal Regulations, which reads “neither place of residence nor place of listing shall be a major determinant of access to a transplant” (DHHS, 1998). Despite the Regulations, the controversy surrounding the geographic disparity in access to transplant has been endless. Literature suggests that a chance of receiving a transplant varies significantly by location, especially for liver and kidney transplants which shares about 80% of organ transplantation (Barshes, 2007; Soret, 2006; Roberts, 2006; Schaffer, 2004; Ellison, 2003; Klassen, 1998; Kemmer, 2008; Reid, 2004). Further, the geographic disparity is reported in other Western countries including France, United Kingdom, Spain and Australia (Morris, 2003).

Organ allocation protocols vary depending on the organ type. Heart allocation policy was established by OPTN/UNOS in 1988. The system remains in place today, with only two major policy changes since its inception (Meyer, 2015). The current allocation system in heart transplant (referred to as the Current policy in the rest of the chapter) is based on the urgency of patients and concentric geographical zones around donor hospitals. UNOS assigns all transplant candidates a status which is based on their medical condition. Status 1A is assigned to patients who are seriously ill, in the hospital, on high doses of inotropic drugs and mechanical circulatory support, and are expected to live less than 1 month without a transplant. Status 1B is assigned to patients who are stable on lower-dose inotropic therapy or on mechanical support, and can be in the hospital or at home. Status 2 patients are stable and ambulatory and are not on inotropic drugs. A guiding principle for heart allocation is to give highest priority to those in greatest need within an acceptable geographic distance. The typical geographic sequence for adult (age 18 or above) heart allocation is local (i.e., DSA) first, followed by increasing concentric circles, specifically of radii equal to 500 miles (Zone A), 1000 miles (Zone B), 1500 miles (Zone C), 2500 miles (Zone D), and more than 2500 miles (Zone E). Waitlisted transplant candidates who are registered at the transplant centers located within the DSA receive offers first, followed by the candidates at the transplant centers within the next concentric circle area (see Table 1). Other major factors influencing the allocation protocol include adult vs. pediatric donor as well as blood type compatibility and whether the patient requires multi-organs (e.g., heart and lung) or heart only (OPTN-policies, 2005).

The OPTN/UNOS Thoracic Organ Transplantation Committee pointed out that mortality on waiting lists is still high for the most urgent patients (Meyer, 2015). As a result, in December 2016 the thoracic committee approved a new policy (referred to as Proposed policy in the rest of the chapter) (OPTN, 2016). The proposed policy had the twofold aim of (i) reducing waiting list mortality rates among the most severe patients, and (ii) improving post-transplant survival rates. The proposed policy modified
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