Repairing the Digital Divide Can Increase the Service Divide:
The Effects of Patient Portals on Kidney Allocation

Introduction: The ubiquity of information technology (IT) has changed the nature of social and economic activities - mostly for good or for the worse. The consequent proliferation of information has the potential to transform the decision-making processes of individuals and organizations. However, the transformational power of IT does not transpire uniformly across the entire economy and population. In this research, we contribute to the discussion on the role of IT in the service divide. We examine a unique healthcare context, access issues around kidney transplants and the role of IT. Kidneys are scarce societal resources, and therefore a central decision maker allocates donated kidneys to patients suffering from end-stage renal disease (ESRD). A fair and efficient allocation is critical, yet a very difficult task. Despite a highly sophisticated allocation system, notable disparities across patient populations exist.

In the context of disparities in accessing kidney transplantation, we examine the following research questions: (i) whether the empowerment of patients through patient-oriented health IT can mitigate the allocation inefficiencies; (ii) whether the adoption of such technologies magnify or alleviate the disparity in the access to the resources (kidneys) for the care service (transplant). We use a rich dataset from national kidney transplant records that details waitlist activities until transplant. We combine transplant data with data on IT adoption by hospitals and also self-reported use measures in the U.S. from 2011 to 2014. We specifically focus on patient portals, which are secure websites that allows information sharing between care providers and patients. In the next, we describe the overview of the kidney allocation process and the expected role of patient portals in patients’ accessibility to the transplant services.

Data and Variables: We utilize data from three sources – Scientific Registry of Transplant Recipients (SRTR) Standard Analytic Files (SAF), SRTR Program-specific report (PSR), and Healthcare Information and Management Systems Society (HIMSS) database, and Meaningful Use reports. SRTR SAF includes transplant center profiles, recipient and donor characteristics. We supplement SRTR SAF with HIMSS database that offers a rich healthcare IT adoption data. We further link the dataset with
SRTR PSR, a semi-annual report on transplant performance of each transplant center. For robustness, we assess the impact of patient portal use vs. its adoption.

We use the time to transplant (deceased donor) as the dependent variable. Time to transplant is the time difference between the registration of a patient to the waitlist and the removal of the patient from the list due to transplant. Policy makers recognize the time to transplant as a primary outcome measure for “Access” and an indicator of allocation efficiency. The main independent variable is Portal, a binary variable that takes the value one if a transplant center has a patient portal that provides access to personal health information. We use two types of control variables, factors related to individual patients and factors related to transplant centers, to account for alternative variations for the time-to-event.

**Analysis and Results:** We use a cause-specific hazard model that analyzes covariate effects on the time duration between an entry and exit of a subject under the existence of more than one event that remove a subject from the record. We show that when a patient has access to a patient portal, the likelihood that the patient receives deceased donor transplant at a given point in time increases. Interestingly, the effect of a patient portal is moderated by a patient’s educational level. A potential explanation for this result is that a higher education level is associated with health information processing skills and those with insufficient health information processing skills can feel frustrated even when a decision aid is available, or lose interest in utilizing information. Furthermore, we see the varying impact of a patient portal in the kidney allocation depending on age and geographical location. This implies that socio-economic factors can play an important role in utilizing information sources featured by patient portals. As a robustness check, we consider the followings: i) the use of subdistribution hazard model as an alternative model; ii) the use of 1-year lagged portal adoption to examine the simultaneity issue; iii) the use of portal functionalities as a main independent variable, such as access to diagnostic tests, personal health record (PHR); iv) the impact of patient portals on patient subgroups who already has limited access (sensitized patients receive less offers and therefore the patient portal impact should not exist); v) the use of usage
of the health IT for information sharing by utilizing “Meaningful Use” dataset from the Centers for Medicare and Medicaid Services (CMS). We find our main results remain qualitatively consistent.

**Conclusion:** Our study shows that a patient’s access to portals can reduce the time to receiving a kidney transplant. This is possibly because of the impact of information availability in patients' likelihood of accepting kidney offers. There are important implications of our findings at multiple levels: i) at the patient level from a chronic disease management perspective, ii) at the organizational level from a business efficiency perspective for a transplant center, and iii) at the societal level from a resource allocation perspective. First, although patient portals have been touted for efficient management of chronic diseases, there has been little conclusive empirical research to support the view that patients make more informed decisions with patient portals and the outcomes would also improve. We believe this research can help in directing future efforts to improve patient management for chronic disease by harnessing the power of patient-oriented health IT. Second, a reduced transplant rate can significantly deteriorate financial soundness of a transplant program. Our findings imply that patient portal adoption can facilitate the rapid placement of donated kidneys and reduce the workload for waitlist management for kidney transplant. Also, knowing the impact of the portal adoption on the waitlist activities can allow transplant centers to utilize resources better. Lastly, there has been extensive discussions on the re-designing of kidney allocation systems. As our findings show, IT at a high level can mitigate some of the inefficiencies in kidney allocation. However, the impact could vary on sub-populations. This indicates that the efforts to bridge the digital divide may benefit some patient groups at the expense of other groups, leading to further disparities in the care service.

**Selected References**