

Transparency in Kidney Transplant Recipient Selection Criteria: A Nationwide Analysis Using AI

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Abstract

Background: Choosing a transplant program impacts a patient's likelihood of receiving a kidney transplant. Most patients are unaware of the factors influencing their candidacy. As patients increasingly rely on online resources for healthcare decisions, this study quantifies the available online patient-level information on kidney transplant recipient (KTR) selection criteria across U.S. transplant centers.

Objective: Quantify the available online patient-level information on kidney transplant recipient (KTR) selection criteria across U.S. transplant centers.

Methods: A cross-sectional study using natural language processing and a large language model was conducted to review the U.S. kidney transplant centers websites from June to August 2024. Links were explored up to three levels deep, and information on 31 guideline-recommended selection criteria was collected from each transplant center.

Results: A total of 255 U.S. kidney transplant centers were analyzed, comprising 10,508 webpages and 9,113,753 words. Among the kidney transplant guideline-recommended selection criteria, only 2.6% of the information was present on the transplant centers webpages. Socioeconomic and behavioral criteria mentioned more than those related to patient medical conditions and comorbidities. Of the 31 criteria, finances and health insurance was the most frequently mentioned, appearing in 25.5% of the transplant centers. Other socioeconomic and behavioral criteria such as family and social support systems, adherence, and psychosocial assessment, were addressed in less than 4%. No information was found in any webpage for 14 of the criteria. Geographically, disparities in reporting were observed, with the South Atlantic division showing the highest number of distinct criteria, while New England had the fewest.

Conclusions: Most online patient-level KTR selection criteria are unavailable. The lack of transparency in the pre-waitlist process involving KTR selection criteria may limit patients from choosing their most suitable transplant center and successfully receiving a kidney transplant.

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Original Manuscript

Cover page**Paper type:** Original paper**Manuscript title:** Transparency in Kidney Transplant Recipient Selection Criteria: A Nationwide Analysis Using AI**Author names and affiliations:** Belen Rivera, MD¹ (ORCID: 0009-0007-4126-743X), Stalin Canizares, MD¹ (ORCID: 0000-0003-4706-862X), Gabriel Cojuc-Konigsberg (ORCID: 0000-0003-3463-6309), MD², Olena Holub³ (ORCID: 0009-0003-7848-7488), Alex Nakonechnyi, PhD³ (ORCID: 0000-0002-1756-2136), Ritah R. Chumdermpadetsuk, MD¹ (ORCID: 0000-0002-1909-7741), Devin E. Eckhoff, MD¹ (ORCID: 0000-0003-2621-1431), Rebecca Allen, PhD³ (ORCID: 0000-0003-0044-2047), Aditya Pawar, MD² (ORCID: 0000-0002-9178-4386)¹Transplant Surgery, Department of Surgery, Beth Israel Deaconess Medical Center, Boston, MA, USA²Nephrology Division, Transplant Institute, Beth Israel Deaconess Medical Center, Boston, MA, USA³Center for IT Engagement (cITe), Department Computer Science and Mathematics, Mount St. Joseph University, Cincinnati, OH, USA**Corresponding author:** Aditya Pawar. Address: 110 Francis St, 02215, Boston, MA, USA. Telephone number: +1 (617) 632 9880; Fax: (617) 632 9820; Email address: aspawar@bidmc.harvard.edu.**Key words:** Kidney transplant; Kidney transplant recipient; Selection criteria; Artificial intelligence; Large language model; Natural language processing.**Abstract**

Background: Choosing a transplant program impacts a patient's likelihood of receiving a kidney transplant. Most patients are unaware of the factors influencing their candidacy. As patients increasingly rely on online

resources for healthcare decisions, this study quantifies the available online patient-level information on kidney transplant recipient (KTR) selection criteria across U.S. transplant centers.

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Conclusion: Most online patient-level KTR selection criteria are unavailable. The lack of transparency in the pre-waitlist process involving KTR selection criteria may limit patients from choosing their most suitable transplant center and successfully receiving a kidney transplant.

Main text

Introduction

Kidney transplantation is considered the gold standard treatment for patients with end-stage kidney disease.¹⁻³ However, to receive a kidney transplant, a patient must first be referred, evaluated, deemed a suitable candidate, and then listed at a transplant center.^{4,5} Patients may not be fully aware of the factors that shape their candidacy for a kidney transplant.^{1,6} Selecting a transplant program is a critical decision, with far-reaching implications that impact the success of receiving a transplant.⁵

Reports from the Organ Procurement and Transplantation Network (OPTN) Ethics Committee on transparency in program selection, the National Academies of Sciences, Engineering, and Medicine (NASEM) on advancing equity in transplantation, and the Health Resources and Services Administration (HRSA) initiatives emphasize the importance of accessible information in supporting shared decision-making.^{7,8} In addition to the recognized lack of transparency of information, there is notable heterogeneity in the pre-waitlisting practices and kidney transplant selection criteria reported by transplant centers.^{5,7,9-11} These inconsistencies contribute to inefficiencies and inequities impacting waitlisting and eventual transplantation, especially considering that insurance plans may only cover a single transplant evaluation.⁷

Despite the evolving landscape of policies aimed at increasing equity and access in the pre-waitlist process, such as the Increasing Organ Transplant Access (IOTA) Model, a critical information gap remains in quantifying the extent of the unavailable information regarding transplant recipient selection criteria that helps to guide the construction of these policies.¹² Furthermore, in an era where patients increasingly use online resources for healthcare decision-making, accessible online patient-level kidney transplant eligibility information may aid patients in selecting their most suitable transplant program.¹³⁻¹⁶ Recurrent themes have been expressed by patients regarding the difficulty in finding patient-centered information and the lack of transparency throughout the kidney transplant process, which hinder their ability to make informed decisions.¹⁷⁻¹⁹

While the national organ allocation system is explicit, the criteria for determining transplant candidacy of an individual patient remains unclear for majority of patients. Fragmented data and an overwhelming volume of information across nationwide programs and their various website links, can be challenging for human evaluators to navigate. Moreover, dynamic nature of online content further complicates the evaluation process. Therefore, employing artificial intelligence (AI), namely training a large language model (LLM), emerges as a valuable tool to automate this analysis, making it comprehensive, scalable, and efficient.

In this study, we aimed to use a natural language processing (NLP) and a LLM to quantify the available online patient-level information regarding guideline-recommended kidney transplant recipient

(KTR) selection criteria reported by U.S. transplant centers.

Methods

As a brief overview of the study's methods, we determined guideline-recommended kidney transplant selection criteria²⁰, aggregated data from U.S. kidney transplant center websites, and trained and refined a LLM to analyze the available information. The method sequence is illustrated in Figure 1.

A determination form confirming the study does not involve human subjects was approved by the Beth Israel Deaconess Medical Center Institutional Review Board.

Selection Criteria Definition

Kidney transplant recipient selection criteria categories used in our analysis for the LLM were collected by consulting the Kidney Disease: Improving Global Outcomes (KDIGO) Clinical Practice Guideline on the Evaluation and Management of Candidates for Kidney Transplantation.²⁰ This guideline is designed to aid decision-making and provides a framework for the eligibility criteria, all of which were included in our list (Table 1). In addition, to broaden the scope of possible selection criteria, we conducted a manual search of the 15 New England region transplant center websites and added frequently mentioned criteria not present in the guidelines (Supplemental Table 1).

Data Aggregation

We accessed the Scientific Registry of Transplant Recipients (SRTR) to compile a list of 255 kidney transplant centers in the U.S. Specifically, in the search bar, 'kidney' was selected as the organ, and then each state was reviewed to include the associated transplant center(s) in our dataset.

To access the transplant centers' websites, we conducted an online search using Google²¹ searches via SerpAPI²² with the keywords 'kidney' and 'transplant' along with the name of each kidney transplant center and selected the first organic result. We opted to use Google since it is the most common search engine with 82% of market share worldwide.²³ To ensure a systematic approach, we used SerpAPI, a search engine tool designed to access results programmatically in a structured format.²⁴

Each transplant center's first organic result was manually reviewed. If the result did not appear to represent the center's main website, the top ten search results were examined to locate the correct main website. We included text from subpages that were linked to the main website, up to three levels in, and to

ensure relevance, only pages containing both ‘kidney’ and ‘transplant’ were included in the dataset.

Centers that lacked a clearly identifiable website or appeared only in aggregator listings were excluded from the scraping process. Webpages that required a log in, asked for payment, or disallowed scraping were also excluded (Supplemental Table 2).

After defining the webpages to include, we conducted data scraping for content aggregation. For this purpose, AngleSharp²⁵ was the HTML parser, DotNetBrowser²⁶ was the programmable browser emulator, UglyToad.PdfPig²⁷ was used to parse pdfs, and SQLite²⁸ was used as the database.

Natural Language Processing and Large Language Model Analysis

NLP and large language models (LLMs) enable the interpretation or computerized *reading* of unstructured text and transformation of the text into structured data for analysis. Llama v3²⁹ was employed to conduct the LLM analysis. Initially, data from 15 manually annotated webpages was used for training the model to identify the 31 predefined selection criteria in the scraped text from all the webpages included.

First Model Testing

A random sample of 20% of the webpages scraped from these first-pass LLM results was then hand-reviewed by two investigators (BR and SC), who achieved an interrater reliability of 97.8%. This human-reviewed sample was used as ground truth. This first-pass model demonstrated strong recall within the random sample missing less than 0.3% of relevant data. However, while it resulted in high sensitivity (97.6%), it had unacceptably low specificity (4.2%). Therefore, we continued to train the model to improve its performance.

Second Model Validation

The primary reason that the first pass-trained version of the model had a high number of false positives was that it tended to misclassify word mentions as kidney transplant selection criteria. For instance, the mention of diabetes on a website does not necessarily mean that it is a transplant criterion. Therefore, to refine the specificity of the model, the annotated sample from the first-pass training was used to train the model.

Training the model using the additional hand annotated data resulted in highly accurate estimates of the presence of the 31 criteria across the transplant centers websites. Detection estimates were calculated with both 95% and 99% confidence intervals. For 23 of the 31 categories, detection rates fell within the 95% confidence interval, while 5 categories met the 99% confidence level. However, 3 categories exceeded the upper bound of the 99% confidence interval: glomerular filtration rate (GFR) (by 35%), dialysis (by 18%), and finances/health insurance. A further refinement of the finances/insurance category reduced false positives by 54%, largely due to the model's misinterpretation of the word 'donor' as a financial donor rather than an organ donor.

In addition to assessing the overall availability of kidney transplant center selection criteria, we further examined the clarity and consistency of the criteria presented online by selecting five criteria and pulled two representative quotes for each, which were then compiled into Supplemental Table 3. This table was used to illustrate the heterogeneity and lack of clarity in how these criteria were described across the websites.

Statistical analysis was conducted using the Python v. 3.12 Matplot, Pandas, and Scikit-learn libraries. Geopandas was used to map the centers based on zip code, and divisions were based on U.S. Census divisions.

Results

We successfully scraped 203 transplant center websites, exploring subpages up to three levels deep. The final dataset comprised 10,508 pages and a total of 9,113,753 words.

Criteria Mentions by Center

An analysis of publicly available websites revealed that most transplant centers included only a limited range of kidney transplant selection criteria. Across all the 203 websites, we found that information on a particular selection criterion is unavailable on transplant center websites 97.4% of the time. As shown in Figure 2, most kidney transplant centers had minimal or no accessible information regarding their transplant criteria. The distribution shows that 56.1% of the centers (n=143) did not provide any information at all. A

smaller number of centers provided limited information, with 53 (20.8%), 38 (14.9%), and 13 centers (5.1%) listing one, two, and three criteria, respectively. Few centers offer information in four or more criteria, with 4 (1.6%) and 2 centers (0.8%) listing four, or more than four criteria, respectively. No center surpassed six criteria mentioned on their website.

Criteria Mentions by Category

Regarding the kidney transplant selection criteria categories, we observed that the most common category mentioned was socioeconomic and behavioral in 27.1% of centers (Table 1).

Of the total selection criteria included, 14 had no information available whatsoever on any of the 203 U.S. transplant centers analyzed. Regarding the specific criteria from this category, finances or health insurance were mentioned at 25.5% of centers, while few centers consider other factors—only 2.0% address family and/or social support system, 1.2% outline adherence and 0.4% mentioned psychosocial assessments; homelessness and support networks are not covered at all. Medical conditions and comorbidities were addressed by just 18.4% of centers, mainly chronic kidney disease stage (5.9%), with other conditions rarely mentioned: life-threatening diseases (4.7%), Human Immunodeficiency Virus (HIV) (3.1%), infection (2.0%), frailty (2.0%), drug or alcohol abuse (1.6%), malignancy (1.6%), smoking (1.2%), and psychiatric illness (0.4%). None of the centers mentioned diabetes, heart disease, peripheral vascular disease, bone or mineral disorders, liver disease, lung disease, neurocognitive disorders or dementia, hematologic disorders, multiple organ failure, or immunological assessments. For demographics and laboratory values, only 17.6% of centers assessed at least one criterion GFR was the most common (13.3%), followed by age (3.9%), and body mass index (BMI) (3.5%).

When evaluating the availability of kidney transplant center selection criteria on patient-accessible websites, we compiled representative quotes to illustrate how selection criteria are presented online (Supplemental Table 3). These quotes highlight that, in addition to the fact that selection criteria were only mentioned 2.6% of the time, many were unclear and/or inconsistent in nature when they were available.

Geographic Variation in Transparency

As shown in Figure 3, the availability of distinct categories of information across the geographic divisions varied significantly. The South Atlantic and East North Central divisions provided the highest percentage of distinct selection criteria, with both divisions showing 41.9% availability. In contrast, the West North Central, East South Central, and New England divisions offered the least amount of information, each with only 16.1% of distinct categories available. Other divisions, such as the Pacific and Middle Atlantic, displayed moderate information availability at 35.5%, while the Mountain division followed closely with 32.3%. The West South Central division, despite having numerous centers, had relatively low information availability, with only 25.8% of distinct categories found (Table 2). We observed an information desert with few to no transplant selection criteria (e.g., ≤ 1 criterion parsed) in a cluster including Idaho, Montana, Wyoming, North Dakota, and South Dakota.

Discussion

In this study, we evaluated patient-level information regarding kidney transplant selection criteria across the U.S. transplant centers' websites using AI and an LLM. Our findings reveal an unmet need for patients undergoing the kidney transplant pre-waitlist process—that most of the online patient-level information (97.4%) on kidney transplant selection criteria is unavailable, with only a small fraction of centers offering more than a few criteria. More than half of the transplant centers do not report any selection criteria, limiting access to crucial information for patients. Moreover, disparities in access to transplant eligibility information were found across geographical divisions, with some being notably more transparent than others.

These gaps in access to online patient-level information are especially significant given the growing reliance on the Internet as a tool for healthcare decision-making.³⁰⁻³² Patients are increasingly turning to online resources to guide their healthcare choices, and the lack of clear and consistent KTR selection criteria in transplant center websites can lead to confusion about their transplant candidacy or center-specific suitability.^{30,33} This lack of access and transparency may undermine patients' and their families' autonomy in taking timely and informed actions regarding their transplant care.⁷

Although lack of transparency in KTR selection criteria is widely acknowledged⁷, this study identifies and quantifies the gaps in the available information which can be a direction for improvement. Policies such as the Presidential Executive Order on Advancing American Kidney Health and Centers for Medicare and

Medicaid Services (CMS) initiatives have increased transplant referrals and tied dialysis facility transplant rates to quality metrics.^{12,34} However, to maximize the benefits of these efforts, policy adaptations such as the IOTA Model,¹² which emphasizes on strategies enhancing transparency in the referral process, are important to improve equity and efficiency.^{19,35} Patients often lack sufficient information about the transplant process, potentially impacting the informed consent.³⁶ Having program-specific selection criteria would be beneficial for nephrologists, who play a crucial role in referring patients to transplant centers and enhance shared decision making.^{4,19,37} If nephrologists had access to the specific selection criteria for each transplant center, they would be better equipped to refer patients to the center most suited to their individual needs.

Our findings align with prior research, which highlights the challenges patients face in locating relevant information to choose a transplant center.¹⁷ Moreover, significant variation in pre-waitlisting practices and access to transplant eligibility information across geographic regions and centers further complicates the decision-making process, as patients may encounter inconsistent or incomplete data depending on where they seek care.^{17,38,39} However, this study is the first to provide a U.S. national-level analysis quantifying the gaps in the availability of transplant center information on their websites. By shedding light on these barriers to accessing kidney transplant selection criteria information, this study support the OPTN Ethics Committee's recommendations for improving transparency in transplant program selection.⁷ Access to and transparency in selection criteria can be assessed using frameworks like Accountability for Reasonableness, which emphasize fairness and equity in healthcare decision-making.^{40,41} Furthermore, decisions about patient candidacy tend to be more acceptable to all parties when the process is perceived as transparent.⁴² Further research is needed to examine how differences in online KTR selection criteria reporting between transplant centers can impact evaluation completion and listing practices.

Beyond the gap in online patient-level information, disparities also extend to the kidney transplant referral process itself.⁴³ Many patients referred for transplant evaluation do not complete the necessary steps, which may stem from unclear provider communication and misinformation.¹ While platforms like SRTR provide important data on transplant center outcomes⁴⁴, these do not usually include details on selection criteria. This highlights the ongoing need for a more transparent and regulated pre-transplant evaluation process, which is crucial for building trust throughout the entire transplant process.^{1,7,19,45}

Although transplant centers generally follow protocol-driven selection processes to assess the suitability of potential candidates,⁴⁶ there is heterogeneity in how selection criteria are shared with patients across centers. While some disclose financial criteria (the most frequently mentioned), others do not. Medical factors, namely clinical cutoffs, are mentioned in less than one-fifth of center websites. Few centers report lifestyle and psychosocial factors, which are decisive in transplant candidacy.^{11,47} Government agencies such as HRSA and NASEM are advocating for strategies to clarify the kidney transplant pre-waitlist process.^{8,48} We suggest that mandatory and regulated disclosure of consistent selection criteria across centers' online patient-level information could be a potential pathway to ensure more equitable access to kidney transplantation.

This study provides relevant insights into the transparency of kidney transplant eligibility information in a novel way using a novel AI and NLP to facilitate broader-scale understanding. Previous research in nephrology has demonstrated that NLP is effective in identifying the presence or absence of qualitative data within large datasets, such as electronic health records.⁴⁹ However, with any AI-driven analysis, there is a challenge in balancing sensitivity and specificity. Our model performed well overall, but it may have missed or inaccurately identified information in certain instances, as is common with AI-NLP approaches. Therefore, these results should be interpreted as an aggregate estimate of the available information rather than a definitive representation of every transplant center's criterion.

Many factors influence transplant eligibility, and standardizing thresholds can be challenging, particularly when certain patient conditions may make eligibility more nuanced, requiring a case-by-case assessment.⁵⁰ Despite this complexity, the reporting of selection criteria including absolute contraindication are valuable. These criteria could be presented with explanations, such as highlighting that certain conditions may be acceptable if optimized or corrected. Disclaimers emphasizing that the information serves as a guide to help patients navigate the system and choose the transplant center most suited to their needs could also be included. We believe that having online patient-level available criteria is crucial in helping patients and providers navigate the pre-waitlist process and a priority in improving the transplant system overall by increasing their chance to complete a transplant evaluation successfully.

Lastly, it is relevant to note that not all centers may keep their websites up to date, and selection criteria may be available to patients through other modalities, such as paper or patient portals. Nonetheless,

these alternatives are not equally accessible to all patients and may further contribute to perceived inequities in the system. Transplant center websites may be primarily created for marketing purposes with varying input from medical doctors, therefore collaboration between medical and administrative teams is crucial to improving the accuracy and utility of patient-level online resources, ensuring that the information provided is accessible and reliable.

As illustrated by the representative quotes from online patient-level information, there is variability in how centers present their eligibility requirements. Therefore, further research evaluating the quality and accuracy of the websites' content is warranted to examine specific differences across centers in online patient-level available information regarding kidney transplant selection criteria. To better understand the heterogeneity between centers' reporting, the use of NLP could be refined to identify and analyze more nuanced aspects of transplant selection criteria.

Conclusion

In summary, we found that 97.4% of the online patient-level information regarding KTR selection criteria is unavailable across centers in the U.S. The extent of this lack of transparency may profoundly limit patients from choosing their most suitable transplant center. Despite current federal initiatives, it remains a challenge to report specific selection criteria for KTR that could increase patients' access to information related to their candidacy. This could foster their autonomy and enable them to make informed decisions when choosing their transplant program, ultimately impacting their access to transplant.

Acknowledgments

The authors have no acknowledgments to declare.

Conflicts of Interest

The authors of this manuscript have no conflicts of interest to disclose.

Abbreviations

NLP, natural language processing

LLM, large language model

KTR, kidney transplant recipient

OPTN, Organ Procurement and Transplantation Network

NASEM, National Academies of Sciences, Engineering, and Medicine

HRSA, Health Resources and Services Administration

IOTA, Increasing Organ Transplant Access

KDIGO, Kidney Disease: Improving Global Outcomes

SRTR, Scientific Registry of Transplant Recipients

GFR, Glomerular Filtration Rate

HIV, Human Immunodeficiency Virus

BMI, Body Mass Index

AI, Artificial Intelligence

CMS, Centers for Medicare and Medicaid Services

CKD, Chronic Kidney Disease

Data Availability

We appreciate the importance of data sharing. Given the scale of the data collected for this study, which includes scraping over 10,000 webpages and processing more than 9 million words, it is not feasible to make the full dataset publicly available. However, all data were obtained from publicly available online patient-level information provided by transplant centers' websites. We can provide access to key data summaries, analysis methods, and code upon request.

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Tables

Table 1. Kidney Transplant Selection Criteria Availability on Transplant Center Websites

Kidney Transplant Selection Criteria	No. of centers with accessible selection criteria (%)	No. of centers without accessible selection criteria (%)
Socioeconomic & Behavioral Factors	69 (27.1)	186 (72.9)

Finances/health insurance	65 (25.5)	190 (74.5)
Family/social support system	5 (2.0)	250 (98.0)
Adherence	3 (1.2)	252 (98.8)
Psychosocial assessment	1 (0.4)	254 (99.6)
Homeless/other unstable living conditions	0 (0.0)	255 (100.0)
Support networks	0 (0.0)	255 (100.0)
Medical Conditions & Comorbidities	47 (18.4)	208 (81.6)
CKD stage	15 (5.9)	240 (94.1)
Life-threatening diseases	12 (4.7)	243 (95.3)
HIV	8 (3.1)	247 (96.9)
Infection	5 (2.0)	250 (98.0)
Frailty	5 (2.0)	250 (98.0)
Drug/alcohol abuse	4 (1.6)	251 (98.4)
Malignancy	4 (1.6)	251 (98.4)
Smoking	3 (1.2)	252 (98.8)
Psychiatric illness	1 (0.4)	254 (99.6)
Diabetes	0 (0.0)	255 (100.0)
Heart disease	0 (0.0)	255 (100.0)
Peripheral vascular disease	0 (0.0)	255 (100.0)
Bone and mineral disorders	0 (0.0)	255 (100.0)
Liver disease	0 (0.0)	255 (100.0)
Lung disease	0 (0.0)	255 (100.0)
Neurocognitive disorder/dementia	0 (0.0)	255 (100.0)
Hematologic disorders	0 (0.0)	255 (100.0)
Multiple organ failure	0 (0.0)	255 (100.0)
Immunologic assessment	0 (0.0)	255 (100.0)
Demographics & Laboratory Values	45 (17.6)	210 (82.4)
GFR (ml/min)	34 (13.3)	221 (86.7)
Age	10 (3.9)	245 (96.1)
BMI (kg/m ²)	9 (3.5)	246 (96.5)
Creatinine clearance (ml/min)	0 (0.0)	255 (100.0)

Others	22 (8.6)	233 (91.4)
Dialysis	22 (8.6)	233 (91.4)
Mobility	0 (0.0)	255 (100.0)

Abbreviations: CKD, Chronic Kidney Disease; HIV, Human Immunodeficiency Virus; GFR, Glomerular Filtration Rate;

BMI, Body Mass Index.

Table 2. Geographic Distribution of Online Information on Kidney Transplant Selection Criteria by U.S. Division and State

Geographic Division	Total Centers	Total Expected Criteria	Total Criteria Found ^a	Average of Criteria Per Center	Criteria Found ^b , %	Distinct Criteria Found ^c , n, (%)
East North Central	36	1,116	32	0.89	2.87	12 (38.7)
Illinois	10	310	14	1.40	4.52	9 (29.0)
Indiana	3	93	0	0.00	0.00	0 (0.0)
Michigan	10	310	5	0.50	1.61	4 (12.9)
Ohio	9	279	8	0.89	2.87	6 (19.4)
Wisconsin	4	124	5	1.25	4.03	5 (16.1)
East South Central	15	465	9	0.60	1.94	5 (16.1)
Alabama	3	93	0	0.00	0.00	0 (0.0)
Kentucky	3	93	5	1.67	5.38	4 (12.9)
Mississippi	1	31	2	2.00	6.45	2 (6.5)
Tennessee	8	248	2	0.25	0.81	2 (6.5)
Middle Atlantic	39	1,209	37	0.95	3.06	11 (35.5)
New Jersey	5	155	13	2.60	8.39	6 (19.6)
New York	15	465	11	0.73	2.37	7 (22.6)
Pennsylvania	19	589	13	0.68	2.21	7 (22.6)
Mountain	17	527	17	1.00	3.23	10 (32.3)
Arizona	7	217	4	0.57	1.84	3 (9.7)
Colorado	4	124	3	0.75	2.42	3 (9.7)

New Mexico	2	62	3	1.50	4.84	2 (6.5)
Nevada	1	31	3	3.00	9.68	3 (9.7)
Utah	3	93	4	1.33	4.30	3 (9.7)
Idaho	0	0	0	0.00	0.00	0 (0.0)
Montana	0	0	0	0.00	0.00	0 (0.0)
Wyoming	0	0	0	0.00	0.00	0 (0.0)
New England	15	465	9	0.60	1.94	4 (12.9)
Connecticut	2	62	0	0.00	0.00	0 (0.0)
Massachusetts	9	279	8	0.89	2.87	4 (12.9)
Maine	1	31	0	0.00	0.00	0 (0.0)
New Hampshire	1	31	1	1.00	3.23	1 (3.2)
Rhode Island	1	31	0	0.00	0.00	0 (0.0)
Vermont	1	31	0	0.00	0.00	0 (0.0)
Pacific	30	930	29	0.97	3.12	11 (35.5)
California	21	651	22	1.05	3.38	11 (35.5)
Hawaii	1	31	2	2.00	6.45	2 (6.5)
Oregon	3	93	2	0.67	2.15	2 (6.5)
Washington	5	155	3	0.60	1.94	2 (6.5)
Alaska	0	0	0	0.00	0.00	0 (0.0)
South Atlantic	41	1,271	47	1.15	3.70	13 (41.9)
District of Columbia	3	93	5	1.67	5.38	3 (9.7)
Delaware	2	62	3	1.50	4.84	3 (9.7)
Florida	13	403	15	1.15	3.72	7 (22.6)
Georgia	4	124	4	1.00	3.23	2 (6.5)
Maryland	3	93	0	0.00	0.00	0 (0.0)
North Carolina	5	155	13	2.60	8.39	8 (25.8)
South Carolina	3	93	1	0.33	1.08	1 (3.2)
Virginia	6	186	5	0.83	2.69	3 (9.7)
West Virginia	2	62	1	0.50	1.61	1 (3.2)
West North Central	24	744	11	0.46	1.48	5 (16.1)
Iowa	4	124	2	0.50	1.61	2 (6.5)
Kansas	1	31	2	2.00	6.45	2 (6.5)
Minnesota	4	124	1	0.25	0.81	1 (2.2)
Missouri	10	310	5	0.50	1.61	4 (12.9)
North Dakota	2	62	0	0.00	0.00	0 (0.0)
Nebraska	1	31	1	1.00	3.23	1 (3.2)
South Dakota	2	62	0	0.00	0.00	0 (0.0)
West South Central	38	1,178	15	0.39	1.27	7 (22.6)
Arkansas	2	62	0	0.00	0.00	0 (0.0)
Louisiana	4	124	5	1.25	4.03	3 (9.7)
Oklahoma	4	124	0	0.00	0.00	0 (0.0)
Texas	28	868	10	0.36	1.15	7 (22.6)

^aThis column illustrates how many times the selection criteria were mentioned on the transplant center websites in a specific division. ^bPercentage of total selection criteria found from the total expected selection criteria. ^cIndicates how

many unique selection criteria (out of the total 31) are referenced on the webpages in that division.

Figures

Figure 1.

Title: Overview of Data Aggregation, Scraping, Cleaning, and Analysis

Abbreviations: SRTR, The Scientific Registry of Transplant Recipients.

Figure 2.

Title: Distribution of Kidney Transplant Accessible Selection Criteria Across Centers

Description: The number of selection criteria mentioned across the U.S. kidney transplant centers websites.

Figure 3.

Title: Geographic Distribution of U.S. Kidney Transplant Centers by Number Selection Criteria Mentioned on

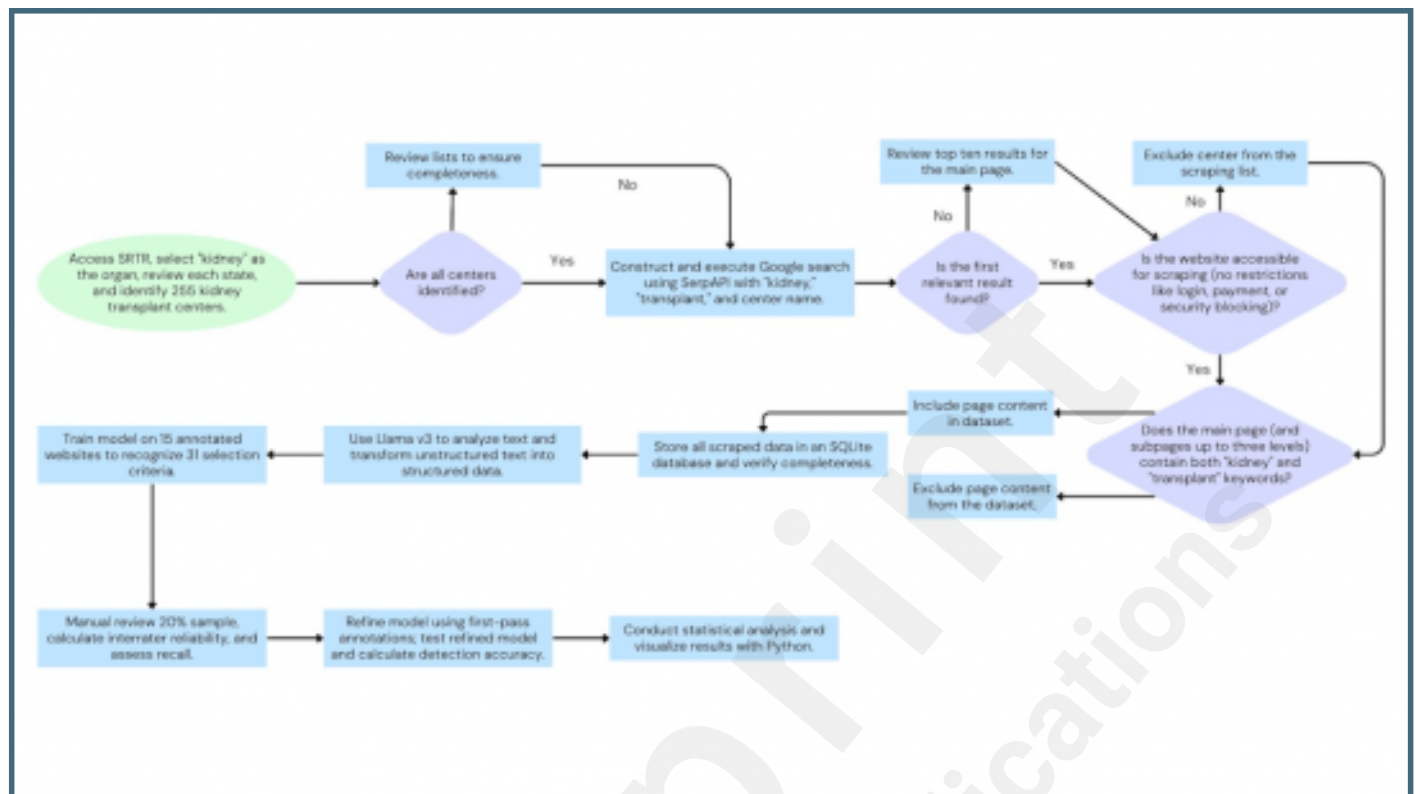
Websites

Description: This map displays the geographic distribution of the 255 kidney transplant centers across the U.S. Each transplant center is color-coded according to the number of kidney transplant recipient selection criteria mentioned on the center's website. The scale ranges from 0 to 6 intensity, where lighter shades indicate centers that mention no specific selection criteria or few criteria, while darker shades correspond to centers that provide the most detailed information on their selection criteria. Smaller gray markers represent centers for which no information could be obtained or that did not pass initial filtering.

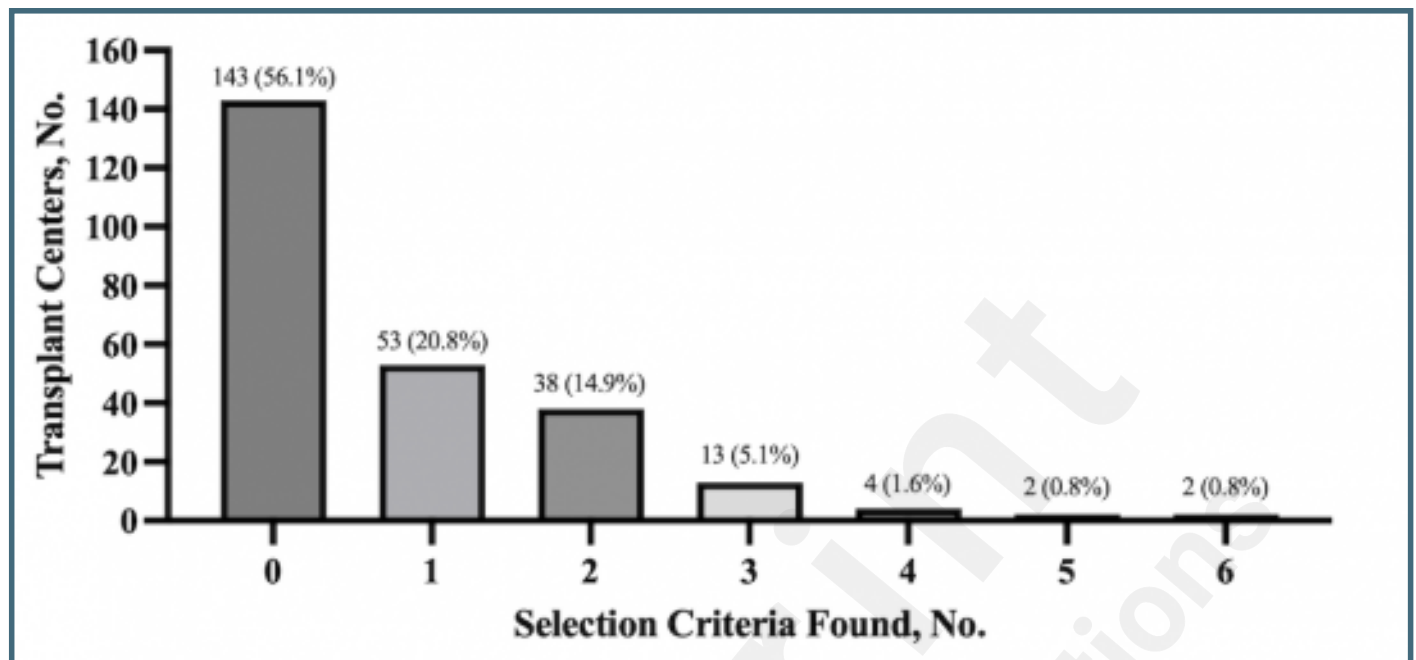
Supplementary Files

Figures

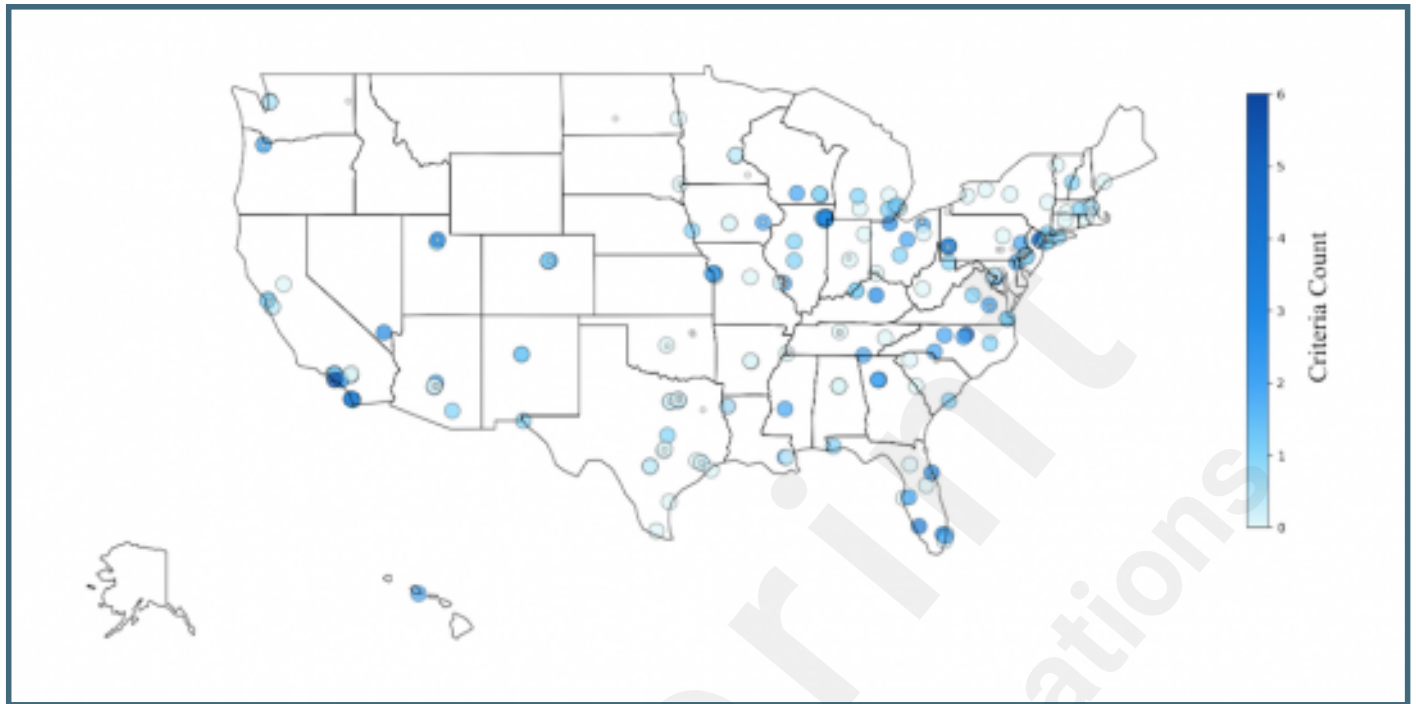
Overview of Data Aggregation, Scraping, Cleaning, and Analysis.



Distribution of Kidney Transplant Accessible Selection Criteria Across Centers.



Geographic Distribution of U.S. Kidney Transplant Centers by Number Selection Criteria Mentioned on Websites.



Multimedia Appendixes

Untitled.

URL: <http://asset.jmir.pub/assets/60936b138d010ee7e1dd1974af2bde84.doc>

