Mapping Transplant Cohorts at University Health, San Antonio: Custom OMOP Concepts for Donors and Recipients

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Background

Solid organ transplantation remains a critical intervention for individuals with end-stage organ failure; however, multicenter observational analysis is often limited to data shared for organ allocation. Mapping transplant patient journeys for quality assessment and observational research is hindered by inconsistent coding and limited standardization around donor-recipient linkage and donor classification in more detailed electronic healthcare records (EHR) data. University Health in San Antonio Transplant program [1,2] sought to standardize data in OMOP to advance the ability to perform these goals. Prior research in the OHDSI community has shown opportunity in transplant mapping of United Network Organ Sharing (UNOS) data [3,4], but donor-recipient mapping remains under-addressed. Our work focuses on extending OMOP with custom donor-type concepts and mapping procedures at University Health to reproducibly define transplant recipient cohorts across donor types along with important process metrics. This work supports future transplant outcomes studies, health services research, and care optimization in high-need populations.

Methods

We leveraged University Health's transplant-related EHR data from 2018–2024, including structured transplant registry information, inpatient and outpatient encounters, and surgical procedures. The data source was University Health's Epic EHR system, with extracts performed via Epic™ Clarity EDW. UHS implemented Epic™ in July 11, 2020, and we included partial historical transplant data available in non-standard fields from before go-live when feasible.

Clinical data are stored in a structured SQL environment, and the OMOP CDM v5.3 was implemented with selected v5.4 elements—specifically the episode table—to better model longitudinal transplant events. An automated ETL pipeline executes weekly to extract data into the CDM.

We deployed OHDSI tools using Broadsea, running containerized services for ATLAS, HADES in an Active Directory managed within PCCI's secure digital data environment called Isthmus, built on the Microsoft Azure Cloud platform. This integrated infrastructure supports version-controlled deployment, scalable analytics, and cross-project data governance.

Custom OMOP Vocabulary Extensions
To address limitations in the OMOP vocabulary for transplant donor types, we developed custom vocabulary concepts to host target fields and maintain data provenance back to the EHR source data with mappings to standardized concepts.

These concepts were added to the Observation domain and mapped to standardized vocabulary codes as applicable. Donor classification was derived from structured transplant registry fields, operative reports, and coded data with linkage maintained to organs as Device concepts and links to the transplant episode using the CDM OBSERVATION_SOURCE_VALUE field.

Donor–Recipient Mapping
Recipient cohorts were defined in ATLAS using combinations of organ type, transplant date, and donor classification. Donor-recipient mappings were derived from transplant registry keys and temporally aligned episodes. OMOP v5.4 Episode domains are being tested to preserve relationships across observations from the same organ episode. All mappings underwent clinical review and validation against registry exports to ensure accuracy and completeness.

Results

The total number of DataMart concepts (n=10,300) included OHDSI Standard, Non-standard, and custom concepts. The custom-based concepts include UNOS based organ transplant, transplant evaluation, or the risk of transplant due to care for liver cancer. Additionally, we initially identified 257 initial targets for extraction to cover a range of transplant specific patient clinical variables, risk models, transplant process steps and outcomes not covered in standard vocabularies of interest to the clinical team. At a high level, 149 concepts related to transplant clinical care, 83 related to Transplant process steps of interest, and 25 related to Donor Organ relations. The higher-level resolution of the clinical data for example allows following detailed sub types such as paired-exchange kidney transplants coordinated across institutions, highlighting the importance of donor-recipient linkage modeling for operational and research use cases. We successfully generated transplant recipient- and donor-based cohorts across multiple organ and donor types using ATLAS tool for outcome and population-based analysis. The manual validation of cohort outputs confirmed donor-recipient linkage accuracy exceeded 90% with missing CDM VISIT_OCCURRENCE data related to import issues of historic visit data into EPIC.

Conclusion

By extending OMOP with solid organ transplant-specific vocabulary, donor classification logic, and episode-based modeling—and deploying within a secure, cloud-based OHDSI environment—we demonstrated a scalable framework for transplant cohort mapping. Our infrastructure, built within Isthmus on Microsoft Azure, ensures secure, reproducible analytics while enabling real-time updates for quality assurance work and cohort maintenance. We anticipate formalizing vocabulary concepts for submission to the OHDSI community for adoption and adaptation of these tools for broader transplant research and data standardization efforts with other institutions on use cases of interest to the broader OHDSI community.

References

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