

Bladder cancer - a quality benchmark utilizing FHIR and OMOP

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Background

The field of oncology heavily relies on high quality and granular patient level data to drive advancements in research and clinical decision-making. Considering this, hospitals have already taken major steps in proper data collection these past years by introducing structured electronic forms in a wide range of pathologies. However, one of the main challenges for multi-center benchmarks and potentially analysis across different centers is the quality of the data. In this abstract we will zoom in on some problems encountered during project ATHENA in the transformation of bladder cancer (BC) cohorts.

The extraction of high-quality electronic health record (EHR) data is crucial for advancing BC research and improving patient outcomes. However, the complexity and heterogeneity of EHR systems often pose challenges in extracting high quality and comprehensive data. In this abstract, we will zoom on utilizing Fast Healthcare Interoperability Resources (FHIR) and the Observational Medical Outcomes Partnership Common Data Model (OMOP CDM) to mitigate difficulties in BC EHR data extraction.

Transurethral resection of bladder tumor (TURBT) [1] is a treatment for non-muscle invasive BC (NMIBC). This is the resection of the tumor in the bladder via a device going through the urethra. Details of the surgery, such as macroscopic aspects of the tumor and its localization and pre-operative complications are reported in the medical report. Following surgery, a multidisciplinary tumor meeting (MDT) takes place a few days later [2]. Detailed information on the pathology, the tumor stage and the presence of detrusor muscle is presented and discussed with different medical specialists to agree on further treatment. Research has shown that the presence of these meetings can improve quality of care. Our quality benchmark platform uses data coming from the structured forms following these encounters.

Methods

We utilized a comprehensive data transformation pipeline to convert HER data into OMOP CDM and FHIR. This process involved mapping and restructuring the original data elements to match the OMOP structure, ensuring consistency and preserving data integrity. Subsequently, we performed quality checks and validation to ensure accurate and complete representation of patient health records.

Quality indicators (QIs) - FHIR: To address the challenge of incomplete and inconsistent documentation practices in BC treatment, implementing QIs can serve as a valuable mitigation strategy [3]. These indicators can provide hospitals with insights into the quality of their data and identify areas where improvements are needed. This enables hospitals to identify areas of focus for enhancing documentation practices and ensuring comprehensive data capture. By monitoring and analyzing QIs healthcare providers

can assess data quality and track improvements over time and can enhance reimbursement rates, ensuring fair compensation for provided services. We analyzed the proportion of patients that should have had a re-TURBT and where the surgery was performed in time (within 6 weeks [4]). This indicator can be calculated for different subpopulations. In this research we focus specifically on the Re-TURBT for patients who had no detrusor muscle present.

$$\% \text{ re-TURBT} = \frac{\text{All TURBTs for no DM * AND subsequent TURBT within 6 weeks}}{\text{All TURBTs for no DM *}}$$

*TURBTs for TaLG/ G1-2 or Tis (primary CIS) excluded

Only patients where no detrusor muscle was found in the resection specimen are included. Additionally, the tumor cannot be Ta or Tis grade. Normally, a TURBT procedure is first documented within a surgery form. Each sequence of a TURBT procedure followed by an MDT which complies to the above conditions is counted. This implies that a patient can be counted multiple times depending on the number of TURBT procedures the patient received.

Longitudinal Patient Trajectory (LPT) - OMOP: By leveraging the temporal and relational aspects of the data, we examined the sequence of events within the disease trajectory.

Results

QIs: Only 3% of the patients, who should undergo a re-TURBT according to the definition, had a structured surgery report available, for the participating centers (3 hospitals, data from January 2021 – December 2022). However, if the interval between both TURB-procedures is doubled (84 days), this percentage increases to 35%. If the interval is tripled (126 days), 61% of TURB procedures without DM receive a re-TURB. It should also be noted that the cohort (the denominator) is very small: only 31 patients are eligible. The reasons might be manifold: too strict inclusion criteria, or the reporting forms are incorrectly or partially used (e.g., clinicians forget to fill out the pathology results).

LPTA: Our analysis revealed two notable inconsistencies in the longitudinal patient trajectories. Firstly, we identified instances where pathology results were available without any preceding procedure documentation. This lack of documentation raised concerns about the completeness and accuracy of the data, potentially leading to incomplete understanding of the patient's diagnostic journey. Secondly, we observed cases where procedures were performed, but subsequent pathology data was not recorded, potentially indicating gaps in post-procedure monitoring or data capture. These findings highlight potential areas for improvement in clinical workflows, data capture processes, and documentation practices.

To assess potential data quality issues at source, the data quality dashboard was extended with disease specific rules. A warning is generated if a TURBT procedure is not followed by a T-stage in one week, unless another TURBT procedure (re-TURBT) exists within a six-week window. A similar warning is generated when a T-stage is recorded without accompanying a TURBT procedure. The extension of data quality checks to include disease specific logic offers added value on top of regular data quality checks.

Conclusion

The challenges of incomplete documentation practices and inconsistent data export in BC treatment can significantly impact data quality and hinder effective analysis. However, implementing mitigation

strategies can potentially help overcome these challenges and improve the reliability and standardization of data. By leveraging FHIR and OMOP in BC EHR data, we can ensure comprehensive data inclusion, and improve data registration and quality. FHIR provides a flexible approach to accessing and retrieving patient-level information from diverse EHR systems. OMOP CDM complements FHIR by transforming and standardizing heterogeneous EHR data, which is essential for accurate data registration. By leveraging standardized data protocols healthcare organizations can optimize data quality and enhance decision-making in BC treatment.

Bibliography

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