

Real-World Patient Pathway of Care for Diffuse Large B-Cell Lymphoma (DLBCL)

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Background

- A good understanding of cancer care continuum (patient pathway) presents many opportunities to uncover unmet medical needs and to improve outcomes and clinical workflow efficiency.¹
- Process mining is a novel approach of statistical and graphical analytics that extracts information from event logs such as electronic health records (EHR).²
- In DLBCL, use of immunophenotyping and molecular diagnostics is the most important first step in the care process according to recommendations by the NCCN and the WHO.³
- Application of process mining with real-world data from DLBCL patients may provide insights on real-world patient pathways of care and guideline-recommended diagnostic testing for appropriate DLBCL classification in clinical settings.

Methods

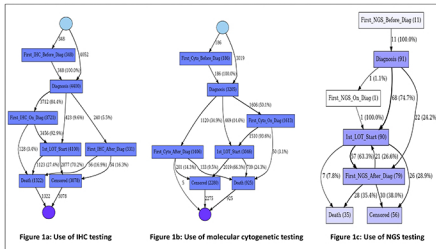
- Using information from the Flatiron Health EHR derived de-identified database with patients diagnosed with DLBCL, we evaluated the use of process mining analytics for visual investigation to aid in the understanding of:
 - guideline-recommended diagnostic testing for appropriate DLBCL classification in clinical settings;
 - real-world patient pathways of care from initial diagnosis through diagnostic testing and line of therapy, until death or end of the study follow-up.
- Diagnostic testing includes immunohistochemistry (IHC) and molecular cytogenetic diagnostics (fluorescence in situ hybridization [FISH] or karyotype) for markers with a confirmed known result that can be used to classify cell of origin according to Hans algorithm and to identify double-/triple-hit lymphoma and double expressor lymphoma.

Results

- A cohort of patients with DLBCL (N = 5387, female 45%, mean age at diagnosis 66.4±13.6 years) ≥18 years old, diagnosed between 2011 and 2019 were selected from the Flatiron Health EHR derived de-identified database.
- Applying process mining analytics to explore the data, we were able to quickly identify patterns of diagnostic testing (Figure 1) and treatment (Figure 2) that enable us to gain an overview of clinical practice of care pathways for DLBCL patient.

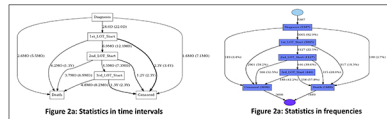
Process mining analytics can be used to generate real-world clinical insights by institutions for benchmarking and for care pathway optimization.

Figure 1: Visualization of different selections of nodal points to gain understanding about the use of diagnostic testing in clinical settings



- Figure 1 shows how the visual methods used in process mining helped understand the use of different diagnostic tests in clinical settings during the study follow-up period:
 - 4400 (82%) patients had evidence for IHC testing
 - 3205 (59%) patients had evidence for FISH or karyotype testing
 - Only 91 patients had evidence for next-generation sequencing test
 - Among those with evidence of diagnostic testing, 3721 (85%) and 1613 (50%) had the first test performed on the day (specimen collection date) of DLBCL diagnosis by IHC and molecular testing, respectively.

Figure 2: Visualization of line of therapy with preferred reporting statistics during the study follow-up



- In Figure 2 a set of treatment related nodal points and preferred reporting statistics were selected in helping understand the gaps of general care process.
 - During a median follow-up of 19.2 months (IQR: 6.1-43.8), most patients (n = 5005, 93%) started treatment within a median of 24 days (IQR: 14-36) and very few (n = 131) participated in clinical trials.

Discussion

- Process mining research is an emerging field and provides an analytical toolkit to visualize high heterogeneity of real-world data that helps understand the real behavior of patients, resources and performance of healthcare services.
- Process mining can help quickly explore the data and identify common/uncommon care process, which makes the observed patient pathways susceptible to non-formative aspects of the input data:
 - Need of correctly detecting arbitrary and block-structured loops, where a priori assumption about the process and solid understanding of the database may help;
 - selection of nodal points and reporting statistics can influence the observed patient pathways;
 - patients with DLBCL might have been tested but not documented in the EHR system or might have biomarker testing performed at sites outside of the Flatiron Health network.

References:

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- National Comprehensive Cancer Network Clinical Practice Guidelines for B-Cell Lymphomas. version 1.2020 (https://www.nccn.org/professionals/physician_gls/pdf/b-cell.pdf)