DLBCL Adapt IQ: A Molecular-Adaptive Clinical Decision Support System for Personalized Regimen Selection and Real-Time Clinical Trial Matching: Development and Dataset Validation in Diffuse Large B-Cell Lymphoma

F. Abualhommos [2], L. Alhusari [1], A. Almusleh [3], M. Hattab [2], A. Daraghma [2], O. Faqih [2], R Fetyani [2]

1. Marshall University, Joan C. Edwards School of Medicine, Huntington, WV
2. Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine
3. Willis Knighton Health System, TX

INTRODUCTION

- Management of diffuse large B-cell lymphoma (DLBCL) relies on static guideline-based algorithms that do not adapt to real-time patient-level response and toxicity data.
- We provide point of care tool that combines line of therapy aware regimen ranking, cycle by cycle adaptive re-evaluation, and integrated clinical trial matching in a single capable application.

METHODOLOGY

- DLBCL AdaptIQ is a clinical decision support tool designed for resource-limited settings.
- The system integrates 28 patient variables including IPI components, cell-of-origin subtype (GCB vs. ABC), MYC/BCL2/BCL6 FISH and IHC values, LVEF, renal function, ECOG performance status, and prior therapy line.
- A rule-based expert engine, grounded in NCCN 2025, ESMO, and BSH guidelines and anchored to published trial data (POLARIX, ZUMA-7, TRANSFORM, REMoDL-B, CAVALLI, LOTIS-2, GO29365, NP40126); scores 14 regimens across four axes: efficacy fit, toxicity/organ-function constraints, guideline alignment, and adaptive cycle penalty.
- The physician enters Deauville PET score, CTCAE toxicity grade, ANC, and LVEF
- Additional features include a clinical trial matcher linked to 10 NCT-verified DLBCL trials with live ClinicalTrials.gov API integration, a Kaplan-Meier-style PFS curve visualizer, a cumulative toxicity heatmap, and a structured Tumor Board PDF export.
- To evaluate output accuracy, all 209 cases from the TCIA DLBCL-Morphology dataset (Vrabac et al.) were individually entered into the tool.

TAKE HOME MESSAGE

- DLBCL AdaptIQ is a novel, free, and accessible clinical decision support framework validated against a 209-patient annotated pathology cohort, demonstrating high accuracy across molecular classification, risk stratification, and regimen scoring.
- Prospective validation against treatment outcomes is recommended

TOOL DESCRIPTION

- The tool generated individualized, guideline-concordant recommendations across all lines of therapy with correct IPI score computation in 94.6% of complete cases (n=203), 100% concordance for IPI 4-class risk group assignment, and 99.5% R-IPI risk group concordance.
- Biological consistency (PFS ≤ OS) was confirmed in 100% of patients.
- Tool-derived biomarker classifications; including double-expresser rate (12.1%), MYC FISH positivity (7.8%), and BCL2 FISH positivity (22.4%), aligned with established literature benchmarks across all parameters.
- No clinically significant systematic error was detected.
- The tool has been registered with the U.S. Copyright Office as an original software work.