ONCOPRE

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ONCOPRE: A new chemotherapy benefit prediction algorithm to assist treatment decision making

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BACKGROUND: Modern oncology is increasingly complex and clinical decision support tools (CDSTs) have become indispensable tools for helping physicians make correct treatment decisions and inform care. For colon cancer specifically, CDSTs such as Adjuvant! Online and Numeracy are frequently used by clinicians to estimate the benefits of adjuvant treatment. Existing CDSTs, however, have not been able to keep abreast of advancements in our understanding of colon cancer biology, such as the impact of microsatellite instability (MSI) or high risk features (HRF) in early-stage colon cancer. Existing CDSTs are also not optimized to run on mobile devices such as tablets and smartphones, and some rely on outdated technology such as Java.

METHODS: We present ONCOPRE, a chemotherapy benefit calculator for colon cancer that addresses the limitations of existing CDSTs. It predicts 5-year colon cancer outcomes based on epidemiological data and the results of landmark trials. To validate ONCOPRE's predictions, we will compare them with the predictions generated by existing CDSTs as well as real-world data from tertiary cancer centers in Canada.

RESULTS: ONCOPRE is able to predict the 5-year disease-free survival (DFS) and overall survival (OS) of colon cancer patients based on age, sex, tumor characteristics and other prognostic markers such as the presence of HRF, BRAF mutations, and MSI. Our predictions compare favorably with the outcomes of landmark trials and historical data. They are precise, generally more optimistic than historical data, and are able to handle a wider set of circumstances than existing CDSTs. We believe that these attributes make ONCOPRE the new benchmark in the area of CDSTs for colon cancer outcomes.

CONCLUSION: ONCOPRE represents a new CDST that can assist in treatment decision-making and patient counseling. We make the case that the next generation of CDSTs in oncology must take into account contemporary clinical, biochemical, and genetic risk factors as these elements significantly affect outcomes. The ONCOPRE platform serves as a potential model on which to develop prediction tools for other forms of cancers. It is freely accessible at http://www.oncopre.com/. See site for references.

FIGURE 1: The inputs and outputs of the ONCOPRE application

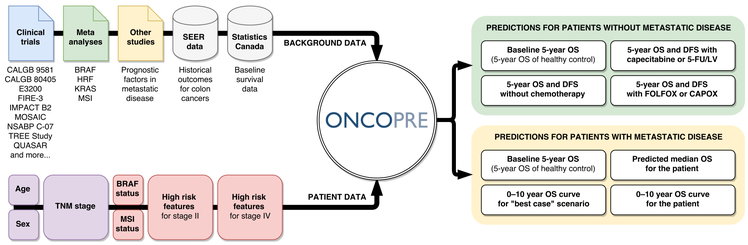


FIGURE 2: Screenshots of the ONCOPRE application as seen on a desktop PC (accessible at http://www.oncopre.com/)

3A. Predictions for a 60-year-old male patient with stage IIA colon cancer and no high-risk features, demonstrating minimal benefit of chemotherapy

3B. Predictions for a 60-year-old male patient with stage IIA colon cancer and several high-risk features, showing increased benefit of chemotherapy

3C. Predictions for a 60-year-old male patient with metastatic disease after progression on 1st line palliative chemo, with median OS and curve

FIGURE 3: Devices compatible with ONCOPRE and system requirements

Desktop computers (any operating system) • thin clients (any operating system) • tablets (iOS, Android) • smartphones (iOS, Android) • a modern browser (Firefox, Chrome, Safari) with JavaScript is required to run ONCOPRE

FIGURE 4: Key assumptions and linear regression models that form the basis of ONCOPRE predictions

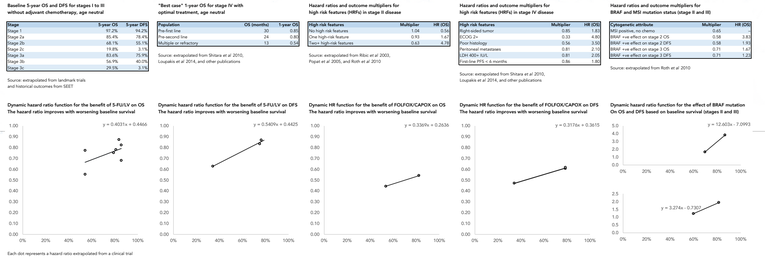


FIGURE 5: ONCOPRE algorithm pipeline in detail

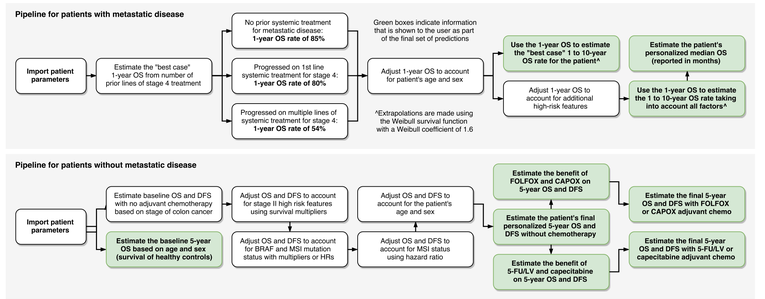
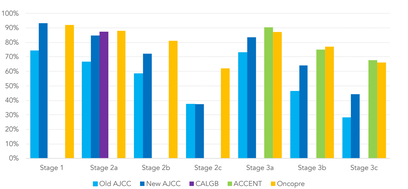


FIGURE 6: validation studies

PATIENT CHARACTERISTICS				AJCC	ACCENT	ONCOPRE	
Age	Gender	Stage	TNM	5-year OS	5-year OS	5-year OS	5-year DFS
60	Male	1	T1 N0 M0	93%	n/a	92%	92%
60	Male	2a	T3 N0 M0	85%	n/a	88%	83%
60	Male	2b	T4a N0 M0	72%	n/a	81%	73%
60	Male	2c	T4b N0 M0	37%	n/a	62%	52%
60	Male	3a	T2 N1a M0	83%	90%	87%	82%
60	Male	3b	T3 N2a M0	64%	75%	77%	69%
60	Male	3c	T3 N2b M0	44%	68%	66%	52%
60	Male	4	Tx Nx M1a	8%	n/a	n/a	n/a

Parameters for ACCENT stage III calculator: age of 60, caucasian, male, BMI of 26, ECOG of 0, tumor grade moderately differentiated, 14 lymph nodes, single tumor, left-sided tumor, FOLFOX.

Awaiting further validation with outcomes data from the BC Cancer Agency Gastrointestinal Cancer Outcomes Unit (GICOU) database.