AI for Precision Oncology Evidence: Case Study Research from British Columbia, Canada

RWD13

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Background

Patient access to precision oncology varies across Canadian provinces and territories.

Healthcare systems are ill equipped to generate evidence needed for precision oncology decision-making.

Siloed real-world patient data inhibits learning healthcare.

‘De-siloed, actionable real-word data (RWD) are needed for learning healthcare.’

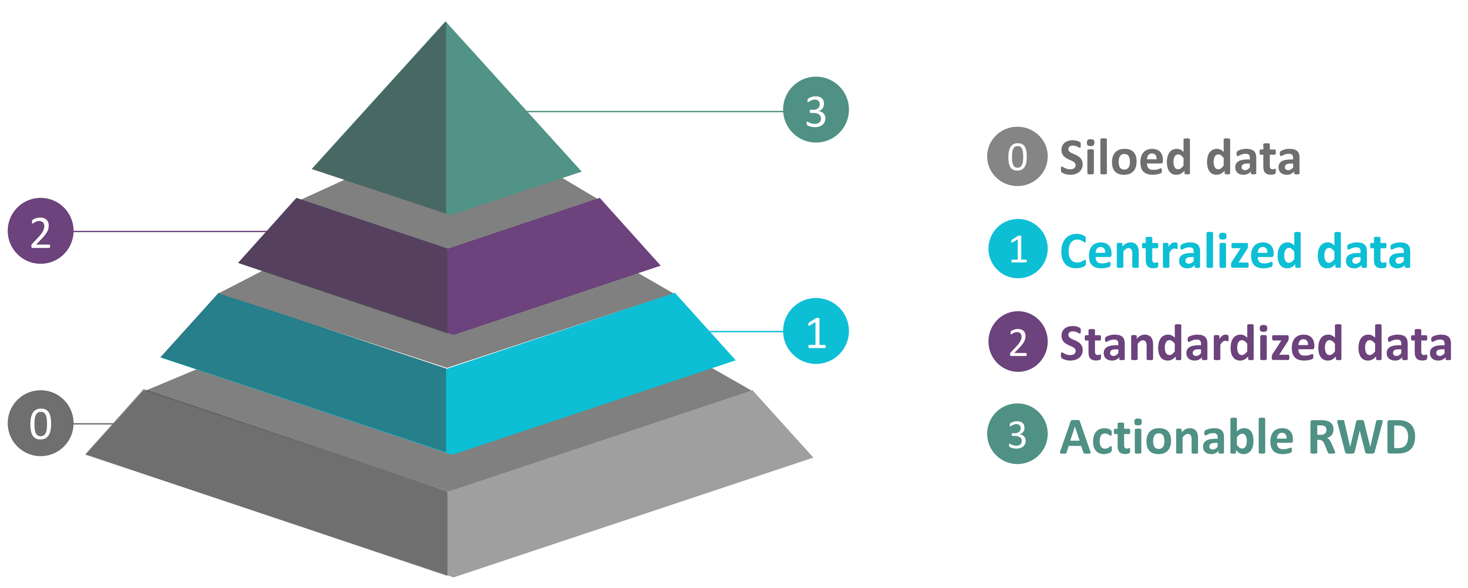


Figure 1: Hierarchy of data for supporting healthcare decision-making

Objective

To determine whether AI approaches can de-silo RWD and enable comparative evidence generation for precision oncology using case study research.

Methods

Case study 1: Automated EHR data extraction

Identify patients with advanced lung (n=148) or metastatic breast cancer (n=63) enrolled in BC Cancer’s Personalized Oncogenomics program between July 2012 and December 2015.

Deploy commercial and in-house NLP and LLM engines (DARWEN™, QwQ-32B) to automate extraction of n=24 data fields from PHSA and BC Cancer EHR documents for cancer care from 1981 to 2021.

Compare performance with manually derive ground truths. Target accuracy set at 85%.

Case study 2: External controls for single-arm trials

Combine single-arm phase I/II trial data (n=54) with cross-jurisdictional RWD on *NTRK*+ patients from BC Cancer (n=16) and Flatiron Health (n=146) to evaluate entrectinib, a TRK-inhibitor conditionally authorized for tumour-agnostic use.

Apply target trial emulation to generate decision-grade real-world evidence, with clone-censor-weighting to mimic randomization and weighted Kaplan-Meier and Weibull regression analysis of survival.

Results

Case study 1: Automated EHR data extraction

Target accuracy achieved for all data fields using commercial engine. Fine-tuning needed to address hedging language. Preliminary in-house estimates have comparable accuracy.

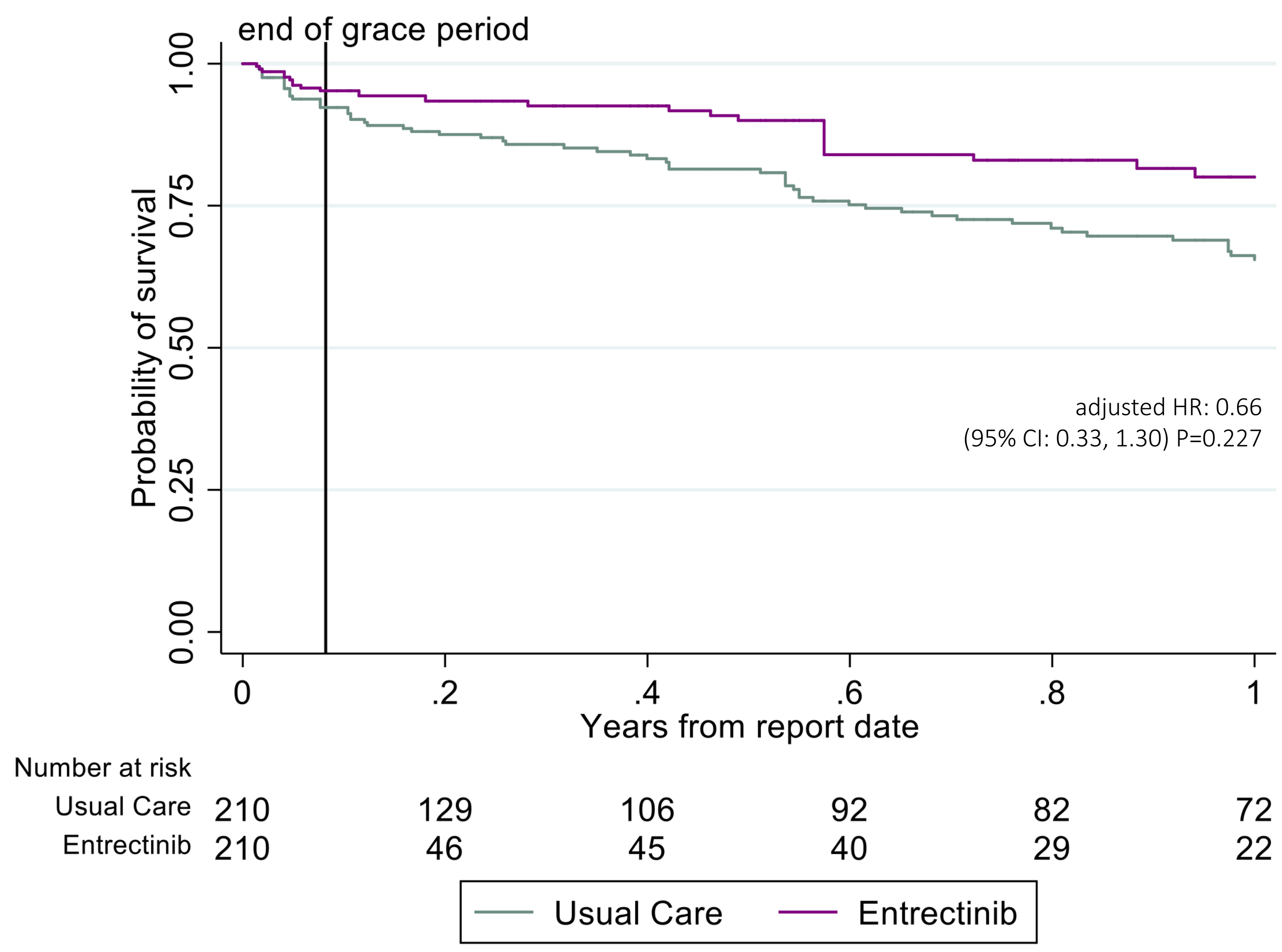
Figure 2: Accuracy of AI-extracted vs. manually derived data fields

‘AI-augmented data and evidence can support decision-making for precision oncology.’

Case study 2: External controls for single-arm trials

Identified a well-balanced counterfactual for entrectinib treated patients. Signal of non-significant survival benefit in a tumour-agnostic setting..

Figure 3: Kaplan-Meier survival estimates



Substantial heterogeneity present across tumour-types. Larger sample size needed to establish tumour-specific treatment effects.

Conclusions

AI approaches can augment data and evidence to facilitate learning healthcare, informing life-cycle decision-making and patient access to precision oncology.

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