Using Real-World Data to Answer Real-World Questions

Understanding and evaluating treatment sequencing in metastatic colorectal cancer

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USING REAL-WORLD DATA TO ANSWER REAL-WORLD QUESTIONS: UNDERSTANDING AND EVALUATING TREATMENT SEQUENCING IN METASTATIC COLORECTAL CANCER

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Outline

1. Background

2. Real-world data visualisation tool

3. Simulation modelling
Colorectal Cancer in Australia

16,398 expected new diagnoses in 2019

11% of all cancer diagnoses

5,597 expected deaths in 2019

11% of all cancer deaths

5-year survival probability of 70%

Source: Australian Institute of Health and Welfare
Metastatic Colorectal Cancer

5-year survival probability of **14%**

**25-50%** develop metastases

**25%** of patients present with metastases

**80%** is unresectable (i.e., non-curative)

**Sources:** Australian Institute of Health and Welfare, American Cancer Society
Systemic Treatment Landscape

First Line

Chemotherapy regimen:
- 5FU/LV
- capecitabine
- irinotecan
- oxaliplatin
- irinotecan-based (FOLFIRI, etc.)
- oxaliplatin-based (FOLFOX, etc.)
- triplet (FOLFOXIRI)

Biological agents:
- bevacizumab
- cetuximab (RAS WT)
- panitumumab (RAS WT)

Second Line

Chemotherapy regimen:
- 5FU/LV
- capecitabine
- irinotecan
- oxaliplatin
- irinotecan-based (FOLFIRI, etc.)
- oxaliplatin-based (FOLFOX, etc.)

Third Line / Refractory

Best supportive care

Chemotherapy regimen:
- trifluridine/tipiracil

Biological agents:
- cetuximab (RAS WT)
- panitumumab (RAS WT)
- regorafenib
Objective

DEVELOPMENT OF A DATA VISUALISATION TOOL

IMPROVED UNDERSTANDING
OF TREATMENT COMPLEXITY

TARGET FURTHER
RESEARCH EFFORTS
Data Visualisation Tool

- **Treatment of Recurrent and Advanced Colorectal Cancer (TRACC)\(^1\):**
  - Approximately 2700 Australian patients entered since 2009
  - Recorded data: characteristics, history, biomarker information, clinical outcomes

- **Categorization of treatments:**
  - Chemotherapy: most intense therapy in treatment line
  - Biologicals: first biological in treatment line

- **Interactive R Shiny application:** [https://personex.nl/research/mcrc-tracc/](https://personex.nl/research/mcrc-tracc/)

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Real-World Treatment Patterns

First Line
\[ n = 2057 \text{ (76\%)} \]

Second Line
\[ n = 1087 \text{ (40\%)} \]

Third Line
\[ n = 428 \text{ (16\%)} \]

472 unique sequences were observed across all patient records

1481 \text{ (72\%)} of first-line treatments were doublet chemotherapy with or without bevacizumab
Further Research

Understand and Communicate Complexity

Identify Patterns and Outcomes

Learn from Previous Experiences

Generalisability of Patient Population

Combining Evidence from Different Sources (Impact)

Limited use for WHAT-IF Scenarios
Research Question

Can we use simulations based on registry data to inform treatment decisions on whether to initiate doublet chemotherapy with or without bevacizumab for first-line treatment of metastatic colorectal cancer?
Methods Overview

• Discrete Event Simulation based on the TRACC registry data

\[
PFS(t) = \beta_0 + \beta_{Treatment} \times \text{Treatment} + \beta_{StageDiagnosis} \times \text{StageDiagnosis} + \ldots
\]

\[
OS(t) = \beta_0 + \beta_{Treatment} \times \text{Treatment} + \beta_{PFS} \times \text{PFS} + \beta_{StageDiagnosis} \times \text{StageDiagnosis} + \ldots
\]

\[
P(\text{event = death}) = \beta_0 + \beta_{Treatment} \times \text{Treatment} + \beta_{PFS} \times \text{PFS} + \beta_{StageDiagnosis} \times \text{StageDiagnosis} + \ldots
\]
Methods Overview

Characteristics:
- Age
- Stage at Diagnosis
- Primary Site
- CEA Level
- BRAF Status
Simulation Results

Patients that switched treatment

- According to Practice
- Personalized Targeting

\[ n = 219 \text{ (25\%)} \]

Complete patient population

- According to Practice
- Personalized Targeting

\[ n = 867 \text{ (100\%)} \]
Conclusions

• Interactive visualisation tools based on real-world data:
  – Communicate real-world practice variation
  – Insights in variation for care providers and decision makers
  – Identify opportunities to focus efforts to improve care

• Tools using these and other operations research methods may allow further personalization of cancer care ...
  – by showing outcomes of previous, similar patients
  – by performing what-if scenario analyses using simulation models
Thank you!

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