Cost-effectiveness of Treatment Sequences for Elderly Metastatic Colorectal Cancer Patients: A SEER-Medicare-Based Modeling Analyses

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BACKGROUND
- Colorectal cancer (CRC) is one of the most expensive cancers to treat and manage in the United States. In 2015, the direct and indirect costs of CRC care was $146 billion.
- Metastatic colorectal cancer (mCRC) has poor prognosis with an overall survival of less than 15% at 5 years. 
- Treatments for mCRC have changed considerably over the last decade with the approval of numerous anti-cancer drugs, vaccines, and immunotherapies.
- Notably, the cost to treat patients with mCRC is twice the cost to treat patients with CRC ($250,000 vs. $140,000 per patient year), and patients with mCRC are likely to receive more regimens, resulting in increased health care costs.
- A recent study by Ramsey et al. (2000) suggested that mCRC patients spent $455,165 per patient year with mCRC costs $140,000 per patient year.
- To our knowledge, no study has characterized the treatment sequences most commonly received by patients with mCRC.

OBJECTIVE
The study aimed to identify the commonly administered treatment sequences using the Surveillance, Epidemiology, and End Results (SEER)–Medicare linked dataset and conduct a decision-analytic pharmacoeconomic evaluation of treatment sequences based on parameters derived from the SEER-Medicare dataset, thereby increasing the generalizability of the findings.

METHODS

Data Source
- The SEER-Medicare linked dataset, which provides health care utilization and cost information for prevalent, outpatient, professional, and inpatient medical care services, was used for the study.

Patient Selection Criteria
- Patients 65 years and older diagnosed from January 2004 to December 2009 were included in the study, where microsimulation analysis was performed.

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MEASURES

Treatment Sequences
- Treatment sequences most commonly received by patients with mCRC were compared and abstracted from the SEER-Medicare linked dataset.

RESULTS

Addition of bevacizumab to first line or may not be cost-effective at the WTP threshold of $100,000 per QALY gained. Similarly, addition of a third targeted biologic (OIB-OIB-TB) was not cost effective. Notably, in a scenario where a third targeted biologic was not added to the first line targeted biologic without bevacizumab at site OI-OIB-TB was decreased to $337,852 per QALY gained.

Threats analyses conducted to estimate the cost at which OIB-OIB-TB (vs. OI-OIB) may become cost-effective at a WTP of $100,000 per QALY gained. OIB-OIB-TB is cost-effective if the third line cost would be reduced by $268 per month.

CONCLUSIONS

Treatments sequences with bevacizumab at first line and targeted biologics at third line may not be cost-effective at the currently used threshold of $100,000 per QALY gained, but a marginal decrease in cost of bevacizumab may make treatment sequences with first line biologics cost-effective.

REFERENCES

CONTACT INFORMATION
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Table 1. Incremental QALYs gained and treatment sequence preference using a deterministic threshold analysis.

Treatment Sequence | Total Incremental QALYs Gained | WTP per QALY (US $)
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OI-OIB-TB | 0.24 | $119,007 per QALY gained
OI-OIB | 0.17 | $119,636 per QALY gained
OI-OIB-TB (sequences OI-OIB and OIB-OIB) | 0.16 | $4,327 per QALY gained
OI-OIB | 0.01 | $308,548 per QALY gained
OI-OIB-TB (sequences OI-OIB and OIB-OIB) | 0.21 | $5,113 per QALY gained
OI-OIB-TB (sequences OI-OIB and OIB-OIB) | 0.23 | $402,228 per QALY gained

Table 2. Cost-effectiveness analysis during treatment follow-up.

| Treatment Sequence | Total Cost (US $) | Incremental Health Care Cost (US $) | Incremental QALYs Gained | Incremental QALYs per QALY (US $) | Incremental WTP per QALY (US $) | Incremental QALYs per QALY (US $) |
--- | --- | --- | --- | --- | --- | ---
OI-OIB | 353,690 | 206,201 | 0.16 | 0.91 | 0.15 | 0.15 |
OI-OIB-TB (sequences OI-OIB and OIB-OIB) | 256,850 | 21,700 | 1.65 | 0.86 | 0.98 | 1.03 |
OI-OIB-TB (sequences OI-OIB and OIB-OIB) | 452,226 | 68,247 | 1.92 | 0.07 | 0.07 | 0.07 |
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Figure 1. Model Structure for Patients With mCRC Receiving Treatment Sequences

Figure 2. Cost-effectiveness Analysis During Treatment Follow-up

Figure 3. CEACs Based on Probabilistic Sensitivity Analysis

*Only QALYs with three tails are shown.*