How Do New Oncology Value-Assessment Frameworks Compare to the QALY?

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BACKGROUND & INTRODUCTION

Rising oncology healthcare costs have spurred several organisations to adopt their own "value-assessment frameworks" (VAFs) as methodologies to determine the 'value' of new oncology treatments for patients, payers and policymakers. Oncology VAFs construct value using a multi-criteria scoring system, with points scored based on health outcomes associated with the treatment (e.g. length of life, adverse event profile, certainty of clinical benefit), but each VAF defines and weights assessment criteria differently. This leads to inconsistency in which treatments are considered more or less valuable depending on which VAF is used.

A previous paper by Bentley et al. [1] compared the oncology VAFs of the American Society of Clinical Oncology (ASCO), National Comprehensive Cancer Network (NCCN), European Society for Medical Oncology (ESMO), and Institute for Clinical and Economic Review (ICER) in terms of how they rank ordered the clinical benefit of fifteen recently launched cancer treatments across three cancer types (lung, breast and prostate). Cost of treatment was not assessed.

This research extends the work of Bentley et al. by estimating the incremental life-years, quality-adjusted life year (QALY) and incremental net monetary benefit (NMB) rankings of the same treatments. The objective of this research was to analyse why oncology VAFs provide different rank orderings of value compared to the QALY when evaluating the same treatments.

METHODS

The four VAFs included in the Bentley and colleagues analysis were the ASCO Net Health Benefit [2], ESMO Magnitude of Clinical Benefit Scale [3], NCCN Evidence Blocks [4] and the ICER Evidence Rating Matrix [5].

To construct a QALY comparison to these VAFs the incremental quality and length of life associated with each treatment was estimated. A common methodology was applied to all fifteen treatments:

- Mean survival was calculated using partitioned survival analysis. The principal trial results reviewed by Bentley et al. were digitised to reproduce the Kaplan Meier curves for progression-free and overall survival, for treatment and comparator regimens. The areas under these curves were calculated using extended mean analysis that assumes an exponential tail.
- Utilities for quality adjustment were taken from the literature and were applied identically to each treatment and comparator by three cancer types. Treatment-related adverse events were calculated as QALY decrements (utility decrement multiplied by time in state), which closely follows the original Q-twist method [6].
- Incremental costs were calculated using treatment costs from the British National Formulary (BNF) multiplied by within-trial chemotherapy cycle length. Intravenous treatments assumed drug wastage but oral treatments did not. Non-drug related treatment costs were not estimated.

RESULTS

Rank orderings of value for the QALY and NMB frameworks do not closely match the oncology VAFs as shown in Figures 1 to 3. This is predominantly due to the extent of simplifications and assumptions used in the oncology VAFs, which reduces the granularity in how health outcomes are measured. As a result, several value proponents are omitted from the oncology VAFs, or inferior metrics of value are used. Table 1 highlights some key variations between oncology VAFs and the QALY that substantially affect the relative magnitude of benefit captured.

Table 1: Potential causes of variance between oncology VAFs and the QALY

Variation	QALY	Oncology VAF
Survival weighting	Calculated using OS and PFS with quality weighting based on time in state	Calculated using OS or PFS only
Effect on ranking:	Gains in survival are weighted for progression-free and progressed survival. This allows segmentation of time in state and HRQoL can be separately applied.	VAFs may stipulate a preference for OS data rather than PFS, discarding the value components of PFS. HRQoL for PFS is omitted. Accuracy in treatment value may be reduced.
Survival estimate	Mean survival	Median survival
Effect on ranking:	Using restricted mean analysis allows accurate measurement of survival from published trials. Extrapolation captures expected future survival. Choice of extrapolation can affect results. Accuracy in treatment value may be reduced.	Median survival underreports survival due to positive skew in survival data. Length of life gained from a treatment is underestimated. Accuracy in treatment value may be reduced.
Survival comparisons	Incremental life years	HR
Effect on ranking:	Life years are calculated using published trial data or patient-level data, with extrapolations into the future for the treatment and the comparator.	Baseline risk not accounted for using HRs. Accuracy in treatment value may be substantially reduced.
Toxicity	Dynamic toxicity penalties	Set toxicity penalties
Effect on ranking:	Treatment related toxicity is calculated by accounting for the HRQoL disutility and multiplying by time affected. This time in state is added as a QALY decrement.	Arbitrary scoring systems may remove up to 15% of the treatment value if it is more toxic than the comparator. Accuracy in treatment value may be substantially reduced.

Abbreviations: HR, hazard ratio; HRQoL, health-related quality of life; OS, overall survival; PFS, progression-free survival; QALY, quality-adjusted life year; VAF, value-assessment framework.

Figures 1 to 3 present the Bentley et al. rank orderings ('Bentley et al.') for breast, lung and prostate cancer treatments alongside our rank orderings ('Post-Bentley et al.'). Our rank orderings include net monetary benefit (NMB), incremental life years (YEARS) and incremental QALYs (QALY). Each drug is ranked according to the value attributed by the VAF. '1st' denotes the most valuable treatment and '5th' denotes the least valuable treatment. Kendall's coefficient of concordance ('*W*') is used to assess the level of inter-framework agreement for treatment rankings. A coefficient of 1 is perfect concordance and 0 is no concordance.

Figure 1: Breast cancer rank orderings by VAF

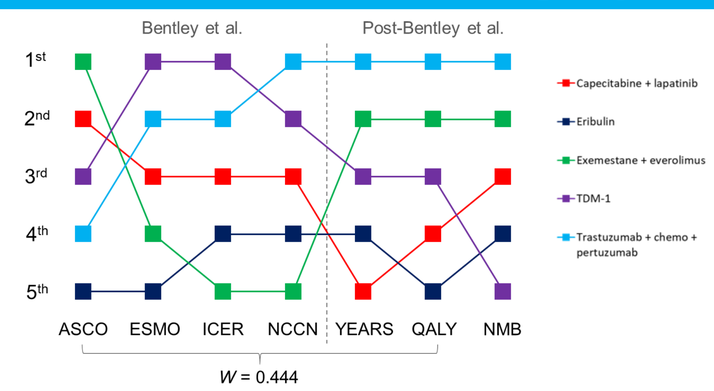


Figure 2: Lung cancer rank orderings by VAF

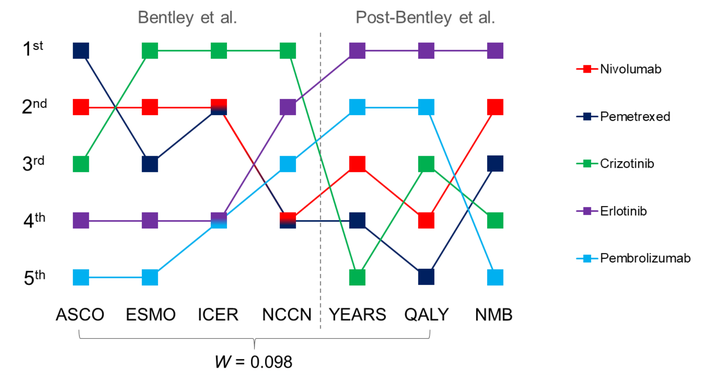
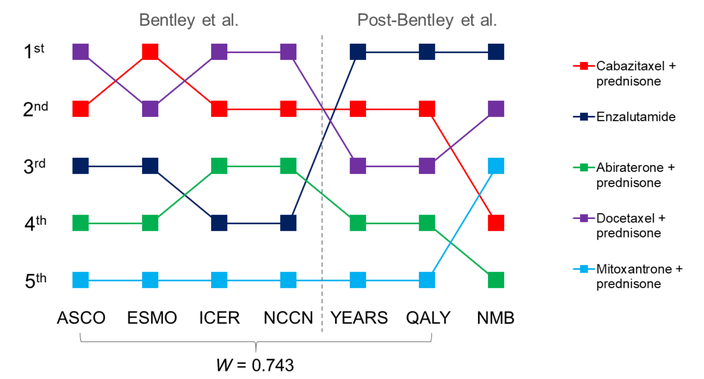


Figure 3: Prostate cancer rank orderings by VAF



LIMITATIONS & CONCLUSION

The main limitations of this research include the assumption than an exponential tail will produce a clinically accurate survival extrapolation. Costs ancillary to the treatment regimen itself were not included, however it may be the case that hospital costs are a driver of the results.

Our results indicate that rankings based on QALY and NMB metrics can differ substantially from oncology VAFs, which have already been shown to differ from one another. In contrast to the oncology VAFs, which are characterised by arbitrary assumptions concerning what constitutes value, QALYs represent a consistent value-assessment framework, the methods for which have been developed and refined over 40 years of practical application. Furthermore, QALYs allow the opportunity cost of cancer treatment relative to other clinical conditions. For these reasons, we see no reason to abandon the carefully constructed QALY framework in place of a more arbitrary oncology-specific VAF.

REFERENCES

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