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Genomic risk stratification in optimising intermediate risk prostate cancer management in Australia: a discrete event simulation

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Abstract: Over 45% of patients diagnosed with prostate cancer are in intermediate-risk groups, often receiving radical treatments despite minimal oncological benefit (PCOR-ANZ, 2023). Radical treatments can reduce the risk of metastasis, but they come with significant complications, such as sexual, urinary, and bowel dysfunction, and they are costly. Active surveillance, on the other hand, avoids these treatment complications and costs but carries a higher risk of metastatic progression. This creates a trade-off between quality of life, costs, and treatment effectiveness. Emerging evidence indicates that genomic risk stratification can optimise treatment recommendations. Among four major tissue-based genomic biomarker tests, the Decipher Genomic Classifier demonstrated significant predictive power and risk reclassification outcomes (Spratt et al., 2023). This study aims to conduct a health economic evaluation from an Australian health system perspective to understand the cost-effectiveness of incorporating the Decipher Genomic Classifier into the management plan of intermediate-risk prostate cancer patients.

We developed a lifetime discrete event simulation and utilised the clinical evidence extracted from a systematic review of the Decipher genomic classifier genomic risk stratification outcome studies. The model incorporates genomic risk level-based time-to-event distributions, including time to treatment, time to treatment failure and undertake salvage treatment, time to metastasis, time to prostate cancer-specific death, and background mortality. It also incorporates the event probabilities, including active surveillance uptake, radical treatment allocation, treatment complications, salvage treatment methods, and metastasis treatment methods. We simulated 30,000 individuals after the model stability examination and compared the outcomes between two alternative clinical management pathways for patients with and without genomic risk stratification.

Patients with genomic test-informed clinical management were estimated to have an average of 2.7 years staying in active surveillance, compared to just 0.5 years in standard practice. Although the overall lived years and metastasis-free survival were similar between the two cohorts, the genomic test cohort also experienced fewer treatments and treatment-related complications, which contributed to the slightly higher quality-adjusted life years (10.675 per patient, compared to 10.547 in standard practice). However, the genomic-tested cohort was estimated to have higher overall costs (incremental cost = AUD 7,720), given a hypothetical price of AUD 9,132[1]. The genomic risk stratification (ICER = AUD 60,222 per QALY) was estimated to be above the willingness-to-pay threshold (AUD 50,000 per QALY). The sensitivity analysis revealed that the test price was a significant determinant of the cost-effectiveness outcomes. Reducing the price to under AUD 8000 could meet the willingness-to-pay threshold, and reducing the price under AUD 1,000 could position the genomic test as the dominant strategy.

While the genomic test approach shows promise in improving patients' quality of life and reducing overtreatment, its cost-effectiveness at current pricing levels remains a significant barrier to widespread adoption. The findings suggest that there is room for price negotiation to make the test more economically viable.

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[1] Price estimated based on the upper bound of the price range reported from the Nebula Genomics: What is Genetic Testing for Prostate Cancer? Learn more in our review!