Cost-Effectiveness Analysis of Advanced Radiotherapy Techniques for Post-Mastectomy Breast Cancer Patients

CURRENT STATUS: UNDER REVIEW

Cost Effectiveness and Resource Allocation BMC

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DOI:
10.21203/rs.2.23226/v1

SUBJECT AREAS
Other Public Policy *Cancer Biology*

KEYWORDS
Cost effectiveness analysis, post-mastectomy, breast cancer, radiotherapy

Abstract

Background: Prior cost-effectiveness studies of post-mastectomy radiotherapy (PMRT) only compared conventional radiotherapy versus no radiotherapy and only considered tumor control. The goal of this study was to perform cost-effectiveness analyses of standard of care (SOC) and advanced PMRT techniques including intensity-modulated radiotherapy (IMRT), standard volumetric modulated arc therapy (STD-VMAT), non-coplanar VMAT (NC-VMAT), multiple arc VMAT (MA-VMAT), Tomotherapy (TOMO), mixed beam therapy (MIXED), and intensity-modulated proton therapy (IMPT).

Methods: Using a Markov model, we estimated the cost-effectiveness of various techniques over 15 years. A cohort of women (55-year-old) was simulated in the model, and radiogenic side effects were considered. Transition probabilities, utilities, and costs for each health state were obtained from literature and Medicare data. Model outcomes include quality-adjusted life-years (QALYs) and incremental cost-effectiveness ratio (ICER), and SOC was used as the reference.

Results: For the patient cohort, IMRT is the most cost-effective technique with an ICER value of 27,310 $/QALY, and IMPT has the highest ICER of 74,564 $/QALY. One-way analysis shows that the probability of cardiac toxicity has the most significant impact on the model outcomes. The probability sensitivity analyses show that all advanced PMRT techniques are more cost-effective than SOC at a willingness-to-pay (WTP) threshold of 100,000 $/QALY, while almost none of the advanced techniques is more cost-effective than SOC at a WTP threshold of $50,000/QALY.

Conclusion: Advanced PMRT techniques are more cost-effective for breast cancer patients at a WTP threshold of 100,000 $/QALY, and IMRT might be the most cost-effective option for PMRT patients.

Full Text

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