

Clinical outcomes and cost-effectiveness of breast cancer screening for childhood cancer survivors treated with chest radiation: A comparative modeling study

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Background: Survivors of childhood cancer previously treated with chest radiation face elevated breast cancer risk similar to BRCA1 carriers. Children's Oncology Group (COG) guidelines recommend annual mammography with breast MRI, yet the benefits and costs of various screening strategies are uncertain.

Methods: We used two breast cancer simulation models (Model 1 and 2) from the Cancer Intervention and Surveillance Modeling Network (CISNET) and data from the Childhood Cancer Survivor Study to reflect high breast cancer and competing mortality risks among survivors. We simulated 3 screening strategies: annual mammography with MRI starting at age 25 (COG25), annual MRI starting at 25 (MRI25), and biennial mammography starting at 50 (Mammo50). Performance of mammography+/-MRI was based on published studies in BRCA1/2 carriers who have similar cancer risk. Costs and quality of life weights were based on US averages and published studies.

Results: Among a simulated cohort of 25-year-old survivors treated with chest radiation, the lifetime breast cancer mortality risk in the absence of screening was 10-11% across models. Compared to no screening, Mammo50, MRI25, and COG25 screening avert approximately 23-25%, 56-62% and 56-71% of deaths, respectively; averted deaths for COG25 compared to MRI25 were higher in Model 1 than Model 2 (9% vs. <1%). In Model 1, both MRI25 and COG25 were cost-effective; in Model 2, MRI25 was preferable (more effective, less costly than COG25).

Conclusion: Compared to no screening, initiating annual screening at younger ages for at-risk survivors averts >50% of breast cancer deaths and is cost-effective. Additional data on test performance are needed to inform recommendations on screening modality.

Strategy	Model 1				Model 2			
	False-positive tests*	Incremental Costs*†	QALYs gained*†	ICER	False-positive tests*	Incremental Costs*†	QALYs gained*†	ICER
Mammo50	259	–	–	–	257	–	–	–
No screening	0	1,033,840	-74.4	‡	0	839,750	-65.4	‡
MRI25	3283	5,629,340	285.3	\$19,730	3764	6,651,870	175.4	\$37,920
COG25	4188	8,439,630	350.5	\$43,100	4879	9,463,560	171.6	‡

ICER, incremental cost-effectiveness ratio (\$/QALY)

*Per 1000

†Discounted

‡Dominated