Breast cancer screening program evaluation in the Basque Country: Health benefits, harms and related costs through discrete event simulation

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OBJECTIVES: Screening mammograms have been done in a biennial basis to women in their fifties and sixties in the Basque Country (Spain), since 1996. The main objective of this project was the evaluation of the screening program in terms of health and costs, in the Basque female population, since 1996 through 2011. **METHODS:** A discrete event simulation model was built to represent the natural history of breast cancer in women invited to the breast cancer screening program in the Basque Country. The disease evolution was described in three main states: healthy, preclinical and clinical. We made the following assumptions: 1) All women would be diagnosed at the beginning of the clinical phase unless they were diagnosed previously through the screening program; 2) The survival distribution for clinically detected or screen-detected breast cancer only depends on the disease-stage at diagnosis; 3) Screening produces a stage-shift at diagnosis, with a more favorable distribution for screen-detected cases. The data collected during the 15 years when the screening program was held allowed validating the model. In order to compare the economic impact of the screening and non-screening scenarios, mammography and treatment costs – depending on the disease-stage at diagnosis – were included. The health impact assessment was based on quality-adjusted life expectancy of cancer patients. **RESULTS:** During the evaluated period 5,267 cancers were screen-detected among 320,366 women who attended the screening program, which represents the participation of 78% of the invited population. The screening program yielded a 16% reduction in breast cancer mortality and a 10% increase in incidence through 2011. However, analyzing a single cohort with lifetime follow-up, 4% of the screen-detected cancers were overdiagnosed. Survival time increased in 2.5 years of life for each screening-detected woman. All the mammograms carried out during the evaluated years cost 55.3 million Euros. Additional diagnosis tests for the positive mammograms in the screening program cost twelve million Euros more. Although early diagnosis permitted saving 39 million Euros in breast cancer treatment during the studied period, in terms of total costs, the background scenario had a lower cost on average. **CONCLUSIONS:** Our results support the continuation of the breast cancer screening program. Early detection of breast cancer decreases treatment costs and improves quality of life in breast cancer detected women.

Keywords: Simulation model, Breast Cancer, Screening.