A Natural History Model of Stage Progression Applied to Breast Cancer

S. Plevritis, P. Salzman, B. Sigal, and P. W. Glynn

- PlevritisSalzmanSigalG07.pdf

Invasive breast cancer is commonly staged as local, regional or distant disease. We present a stochastic model of the natural history of invasive breast cancer that quantifies (1) the relative rate that the disease transitions from the local, regional to distant stages, (2) the tumour volume at the stage transitions and (3) the impact of symptom-prompted detection on the tumour size and stage of invasive breast cancer in a population not screened by mammography. By symptom-prompted detection, we refer to tumour detection that results when symptoms appear that prompt the patient to seek clinical care. The model assumes exponential tumour growth and volume-dependent hazard functions for the times to symptomatic detection and stage transitions. Maximum likelihood parameter estimates are obtained based on SEER data on the tumour size and stage of invasive breast cancer from patients who were symptomatically detected in the absence of screening mammography. Our results indicate that the rate of symptom-prompted detection is similar to the rate of transition from the local to regional stage and an order of magnitude larger than the rate of transition from the regional to distant stage. We demonstrate that, in the even absence of screening mammography, symptom-prompted detection has a large effect on reducing the occurrence of distant staged disease at initial diagnosis. Copyright © 2006 John Wiley & Sons, Ltd.