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Improvement of the sensitivity and sojourn time of mammographic screening: forty years of breast cancer screening in Nijmegen, the Netherlands

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Background: Since the introduction of biennial breast cancer screening in Nijmegen, the Netherlands, in 1975, screening technology has improved and has recently changed from analogue to digital. We investigated whether these technological advancements have led to improved sensitivity of the screening examination and an elongation of the mean sojourn time.

Methods: A repeated prevalence-incidence study based on 19 biennial screening rounds from the Nijmegen program, 1975-2012, was conducted. Screening rounds were divided into five periods based on technological changes in the screening program; 1) early phase of the pilot study (1975-1982), 2) later phase of the pilot study (1983-1988), 3) introduction of nationwide breast screening (1989-2000), 4) after publication of the optimalization study on the Dutch recall rate (2001-2006) and 5) after introduction of digital mammography (2007-2012). Test sensitivity of mammographic screening was calculated based on the number of screen-detected cancers divided by the sum of the number of interval cancers diagnosed in the first year after screening plus the screen-detected cancers. The mean sojourn time and underlying breast cancer incidence were estimated simultaneously using maximum likelihood estimation.

Results: Test sensitivity of the mammographic screening was 84%, 81%, 88%, 90% and 90%, for periods 1 to 5, respectively. Proof-of-principle analyses for the first period showed a mean sojourn time of 2.56 (2.22-3.04) years and an underlying breast cancer incidence of 0.0026 (0.0024-0.0030). Analyses for all five periods will be presented at the ICSN meeting.

Conclusions: The test sensitivity of mammography has improved during forty years of breast cancer screening in Nijmegen. Updated analyses for all periods will show whether the length of the mean sojourn time has increased. If this is the case, modelling studies will need to investigate whether the screening interval in breast screening should be reconsidered on the basis of improved performance.

Keywords: breast cancer screening; mean sojourn time; sensitivity; interval cancers; maximum likelihood estimation