BREAST CANCER SCREENING: UPDATE IN THE AUSTRALIAN CONTEXT

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Abstract

The Australian mammography screening program was introduced as a joint Commonwealth and state/territory initiative in 1991. Australian evaluation studies suggest a breast cancer mortality reduction from mammography screening in Australia that is generally higher than estimated from the original field trials (reported by an International Association of Research on Cancer expert group to be about 35% for screening participants aged 50-69 years, and following a meta-analysis of data for all ages, to be about 25%). More research is needed to broaden the evidence on over-detection. Intervention research is also needed to determine the comparative effectiveness and cost-effectiveness of digital breast tomosynthesis in the Australian screening environment.

The Australian mammography screening program was introduced as a joint Commonwealth and state/territory initiative in 1991, following two-year pilot testing.[1] This followed field trials in North America, Scandinavia and the United Kingdom, where the collective data indicated a breast cancer mortality reduction from mammography screening.[1-3] The design features of those trials have been contested,[4] but a technical expert group, convened by the International Association of Research on Cancer, after re-assessing the trial evidence, concluded that a reduction of around 35% in breast cancer mortality was indicated in 50-69 year-old women who participated regularly in mammography screening.[2] A lower reduction of about 25% was suggested in a meta-analysis of trial data for women of all ages.[5]

The Australian program increased its coverage of the 50-69 year screening target group to about 55% by 1997-98, and this coverage has remained in the 55% to 57% range in the years since then to recent reporting periods.[6] Recently, the target age range was extended from 50-69 years to include 50-74 year olds, following recommendations of the National BreastScreen Australia Evaluation.[1] Older women over 70 years had been eligible for screening since 1991, but not as part of the target age range where active recruitment was practised.[1]

Mortality reductions from mammography screening should be weighed against negative effects, such as over-detection and over-treatment.[7] Trial evidence is often used to assess both the positive and negative effects of screening, due to the potential for confounding in observational research.[7] An important drawback of the trial evidence is that results apply to outdated screening technologies and protocols that would have uncertain relevance to contemporary screening settings.[2] It is important for this reason to consider more timely observational evidence, as well as the original trial evidence, when making a judgement about screening benefits and negative effects.

There have been four formal evaluations of the mortality-reducing effects of mammography screening in Australia. They comprised two ecological and two case-control studies.[8-12] Collective results point to a mortality reduction of about 45% from participating in mammography screening in the 50-69 year age range.[8-12] Estimates of breast cancer mortality reductions among screening participants in individual studies were estimated to be: national evaluation – 34% (method 1),45% (method 2),40% (mean, methods 1 and 2); [8,9] NSW - 43%;[10] SA - 47%;[11] and WA - 52%.[12]

These estimates generally are higher than indicated from the original field trials.[2,5] This may be real, due to advances in screening technology. Alternatively, it may be a result of confounding from an unequal distribution of breast cancer mortality risk factors between screened and unscreened women.[3] For example, if the quality of treatment had been better for screened than unscreened women for some reason, this could have contributed to lower mortality in screened women. In fact, both advances in screening technology and confounding could have had a combined effect. Despite potential for confounding, the evidence from the four evaluation studies is consistent and suggests a breast cancer mortality reduction from screening in Australia that is at least as large as reported from the original trials.[2,5,8-12]

One research team has interpreted secular mortality trends by age in Australia to indicate that the population-based reduction in breast cancer mortality has been mostly due to treatment.[13] By comparison, statistical modelling in the United States suggested that approximately half the mortality reduction was due to screening and half to treatment.[14] and similar results were evident from a UK study.[15] It is very likely that both screening and treatment are contributing significantly to breast cancer mortality reductions in Australia, but the respective proportional contribution of each is difficult to define.

Trial evidence also has been used to assess over-detection (often called over-diagnosis).[3,7] Again there is the question of whether trial results are relevant to contemporary Australian screening environments. Also, the trials were not designed to measure over-detection and only two of them have been used retrospectively for this purpose.[16-18] Results have been difficult to interpret due to under-powering and in one study, limited follow-up to clear the lead time effects post-screening,[16-18] although a recent 15-year follow-up of Canadian trial data reported that about 22% of screen detected invasive breast cancers in that trial were attributable to over-detection.[19] Little evidence was presented in the Canadian or other trial on engagement in privately conducted screening by women after they had left pilot screening, which could have extended lead-time effects,[16-19] although reference was made to the possibility of continued screening in one study.[18]

A plethora of observational studies of over-detection have been undertaken in many populations, yielding vastly different estimates, ranging from near 0% to over 30% of diagnosed breast cancers and ductal carcinomas in-situ.[3] They included a NSW study where the over-detection estimate was at the higher end of the range,[20] and a recent SA study where over-detection was estimated to be at the lower end of the range.[21] Additional observational research is underway in Australia to broaden the evidence base. Over-detection estimates may vary appreciably around the world due to differences in screening environments and differences in study design, especially whether study designs make adequate provision for differences in risk factors and lead time.[22] It will be important to assess the robustness of Australian estimates in the context of differences in study design.

Digital breast tomosynthesis is a new technology still in the testing phase as a screening tool.[23-25] Italian and Oslo trial data both showed an increased detection of breast cancer when tomosynthesis (3D mammography) was included in the screen reading to allow integrated 3D and 2D reading, as compared with digital mammography alone,[23,25] and a potential decrease in recall to assessment rates when using digital breast tomosynthesis.[23,25] A retrospective study of data from 13 North American breast centres has provided similar results.[26] It is not clear at present, however, whether the reported increase in detection sensitivity from tomosynthesis will translate to lower interval cancer rates and reduced breast cancer mortality, and whether the increased cost of this screening methodology will be worthwhile. The Oslo trial is expected to be complete in 2015 and results from another Malmo trial are expected soon.[25] The utility of this new technology needs to be tested in the Australian screening environment.

In summary, Australian evaluation studies suggest a breast cancer mortality reduction from mammography screening in Australia that is generally higher than reported for the original trials. More research is needed to broaden the evidence on over-detection. Intervention research is needed to determine the comparative effectiveness and cost-effectiveness of digital breast tomosynthesis in the Australian screening environment.

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