

ORIGINAL RESEARCH

Mammography screening: how far is too far?

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A B S T R A C T

Introduction: This study answers the question: 'How far must a Canadian woman travel before the risk of a motor vehicle accident (MVA) outweighs the benefits of mammography screening?'

Methods: Numbers needed to screen and false positive rates were extracted from information in the breast screening guidelines from the Canadian Task Force on screening for breast cancer. Motor vehicle accidents per billion vehicle kilometres were extracted from Transport Canada. The charts of women undergoing screening mammograms were reviewed to determine the average number of extra trips generated from a false positive mammogram. A formula was devised to determine when the distance travelled and risk of MVA outweighed the benefits of mammogram screening.

Results: How far a woman would need travel before the risk of that travel outweighed the benefits of screening mammography is determined by the province in which she lives (location) and her age. The distance of a round trip before the risk of travel outweighed the benefit of screening mammography varied from 65 km to 1151 km, according to the patient's age and location.

Conclusion: Travel risk is rarely discussed in recommending screening examinations. Nevertheless the benefits of screening can be outweighed by the risk of travel. Knowledge of travel risk is essential before recommending screening procedures.

Key words: Canada, mammography, motor vehicle accidents, prevention, screening.



Introduction

Mammography is a controversial screening tool¹⁻⁴. As with any screening program, the benefits of lives saved must be balanced against the risk of harm to the patient. One overlooked risk is the danger of travel to the screening site, particularly in large nations such as Canada. While the costs of travel in both accidents and dollar amount has been raised⁵, no literature was found that assessed the risk of injury or death from road travel and its effect on the risk-benefit profile of screening mammography. This article asks 'How far is too far?', before the risk of death or injury on the road outweighs the benefit of screening mammography.

Methods

The number of patients needed to screen and false positive rates for different age groups were taken from the screening mammography guidelines published by the Canadian Task Force on Preventive Health Care⁶. The motor vehicle accident (MVA) risk per kilometre driven was taken from the Transport Canada site⁷.

The authors were unable to find any data on the number of trips generated by a false positive mammogram. As such, screening mammograms of women who turned 50 years between 1 January 1995 and 1 January 2008 at Southwest Middlesex Health Centre were reviewed to deduce how many trips were generated by a false positive mammogram. A false positive mammogram was defined as any mammogram that recommended additional investigations which did not result in a cancer diagnosis. This was then added to the total number of trips women were to take if they chose to undergo screening mammography.

A formula was devised by the authors to determine when the risks of round trip to a screening site outweighed the benefits of screening mammography.

Ethics approval

The study was approved by the Office of Research Ethics, Western University, London, ON, Canada (#17946E) on 21 March 2011.

Results

According to the Canadian Task Force on Preventive Health Care, the number needed to screen for mammography over 11 years is 2108 for women aged 40-49 years, with a false positive rate of 32.9%, 720 for women aged 50-69 with a false positive rate of 28 %, and 450 for women aged 70-74 with a false positive rate of 21%⁶.

Mammograms of women who turned 50 years between 1 January 1995 and 1 January 2008 were reviewed to determine a false positive rate. Of 234 women who had mammograms, 99 had a false positive. A false positive mammogram resulted in an average of 2.12 extra trips, which was rounded off to 2 extra trips for the purposes of calculation.

The formula for estimating the maximum distance travelled before the benefit of mammography is outweighed by the danger of road travel is:

X = maximum number of km driven/trip before risk outweighs benefit

Y = 10^9 km driven/fatalities+injuries

W = number of trips needed to save one woman's life by screening mammography (see Table 1)

X = $Y \times 1/W$

The estimated number of trips necessary to save one woman's life from screening mammography is given (Table 1).

The maximum kilometres round-trip to a screening centre to benefit from screening mammography is estimated (Table 2) for each Canadian province and territory.



Table 1: Estimation of trips necessary to save one woman's life

Age (years)	Needed to treat (N)	False positive (%)	Trips necessary to save one woman's life (NNSx5) + 2(NNSxFalse positive rate) [†]
40-49	2108	32.9	(10 540) + (1387) = 11 927
50-69	720	28	(3600) + (403) = 4003
70-74	450	21	(2250) + (189) = 2439

[†]Trips necessary to save one woman's life = number needed to screen + 2(number needed to screen x false positive rate), where 2 is the number of trips generated by a false positive screening mammogram.

Table 2: Maximum round trip distance before MVA Risk outweighs benefit of mammography. Adapted from Transport Canada data⁷

Province	Risk per billion vehicle-km driven (Y) [†]			Maximum km round trip before risk outweighs screening benefit (X = Yx1/W) [†]		
	Fatality	Injury	Fatality & injury	Age (years)		
				40-49	50-69	70-74
Newfoundland and Labrador	5.7	426.2	432	194	578	949
PEI	6.9	493.7	500.6	167	499	819
Nova Scotia	6.9	476.9	483.8	173	516	847
New Brunswick	11.5	425.9	437.4	192	571	937
Quebec	6.6	594.2	600.8	140	416	682
Ontario	4.5	498.3	502.8	167	497	815
Manitoba	7.2	583.9	591.1	142	423	694
Saskatchewan	12.8	499.5	512.3	164	488	800
Alberta	6.6	349.5	356.1	235	701	1151
British Columbia	10.1	579.3	589.4	142	424	696
Yukon	7.9	433.9	441.8	190	565	928
NWT	9.4	353.6	363	231	688	1129
Nunavut	60.2	1234.6	1294.8	65	193	317

NWT, North West Territories; PEI, Prince Edward Island.

[†]X=maximum km before risk outweighs benefit; Y=km driven/fatalities+injuries; W=#of round trips;

Discussion

The distance a woman must travel to a screening site represents a risk of injury or death that may outweigh the benefit from screening mammography. This distance will vary depending on age and province, from 65 km for a 40 year old in Nunavut to 1151 km for a 70 year old in Alberta. The risk of travel may be reduced by choosing not to travel in winter or only in day light hours. The risk differs depending

on a woman's place of residence. Women who live far from screening centres need to be cognizant of the travel risks they are taking. Mobile mammography units would greatly reduce this risk.

This analysis is limited because MVA statistics pertain to the general population and not only to women in the age range of the screened populations. Gravity of injuries was not recorded in the government data.



Weaknesses of the study include that MVA statistics are for the general population and may differ for middle-aged women and for the time of day and season they travel. The number of trips generated by a false positive mammogram was determined by examining patient experience at our clinic and may not reflect the experience nationally or internationally.

Conclusions

The distance a woman must travel to receive screening mammography changes the risk–benefit profile of the test. This risk should inform a woman’s decision to participate in screening. Women who reside far from a screening site would be well advised to travel when the risk of travel is lowest or to arrange screening when a trip is already planned.

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