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WALTERS, Stephen, WINSLOW, Michelle, COLLINS, Karen
<<http://orcid.org/0000-0002-4317-142X>>, ROBINSON, Thompson, GREEN, Tracy, MADAN, Jason, REED, Malcolm W R and WYLD, Lynda

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Health care professionals' preferences for extending mammographic breast screening to the over 70s

Authors:

Stephen J Walters*¹, Michelle Winslow*², Karen Collins³, Thompson Robinson⁴, Tracy Green⁵, Jason Madan⁶, Malcolm W R Reed⁷, Lynda Wyld⁷

*Joint first authors.

Affiliations:

1. School of Health and Related Research, University of Sheffield, Regent Court, 30 Regent Street, Sheffield, S1 4DA.

2. Academic Unit of Supportive Care, Sykes House, University of Sheffield, Little Common Lane, Sheffield, S11 9NE

3. Centre for Health and Social Care Research, Sheffield Hallam University, Faculty of Health and Wellbeing, 32 Collegiate Crescent, Sheffield, S10 2BP

3. 4. Department of Cardiovascular Sciences (Ageing and Stroke Medicine), University of Leicester, Leicester General Hospital, Gwendolen Road, Leicester LE5 4PW

5. The North Trent Cancer Research Network, Consumer Research Panel, Sykes House, Little Common Lane, Sheffield, S11 9NE

6. Academic Unit of Primary Health Care, University of Bristol, Cotham House, Cotham Hill Bristol, BS6 6JL

7. Academic Surgical Oncology Unit, University of Sheffield, K Floor, Royal Hallamshire Hospital, Sheffield, S10 2JF

Address for correspondence:

Ms Lynda Wyld, Address as above.

E-mail: l.wyld@sheffield.ac.uk

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Abstract

Background. Breast screening improves survival in women aged 50-70. The relative benefits of screening in women over 70 are reduced but women up to age 80 may still benefit. In the UK the National Health Service provides screening by self referral to women >70. This research has investigated health care professionals' (HCPs') preferences for extending screening to older women and factors they consider when advising about screening.

Materials and Methods: UK HCPs from breast or elderly care were recruited. A questionnaire relating to screening in the >70s was administered. A sample of respondents was also interviewed to give added insight.

Results: Questionnaires were distributed to 488 HCPs and 139 replies received, (29%). A total of 26 professionals were also interviewed. Most felt the current system of self referral was under-utilised due to poor user awareness. Predicted life expectancy, co-morbidity and patient preference were viewed as important factors influencing screening recommendation. Chronological age was thought less important. The present system was thought flawed, but there was little enthusiasm for extending screening due to perceived risks and reduced cost efficacy. Some form of selectivity for fitter women was advocated.

Conclusions: There was acceptance that fitter older women may benefit from screening whilst the less fit may be harmed suggesting that some form of selective invitation would be preferable to the present system but would be practically difficult and costly to administer. The present system of self referral was felt to be inadequate due to low levels of awareness and uptake.

Key words: Breast cancer screening, treatment variation, discrete choice experiment, professional preferences.

Introduction

The UK has inferior breast cancer outcomes compared to the European average partly due to more advanced stage at diagnosis, (1) (2). Older women account for one third of all UK breast cancers and lack of regular screening in this age group may be a significant factor in the inferior outcomes in this age group, (3).

In the UK, the NHS Breast Screening Programme (NHSBSP) invites all women for triennial mammographic screening between 50 and 70 years of age. Once a woman reaches 70, she may request continued screening. Although mammographic breast screening reduces mortality from breast cancer by 25-39% in the screened age group, (4) in women >70 there is little direct evidence of benefit, (5), (6), (7). Indirect evidence from cohort and modelling studies suggest that extending screening to women aged up to 80 may be beneficial.

Certainly the incidence of breast cancer continues to increase with advancing age until age 80 (8). There is little doubt that the relative benefits of screening older women may be less and the risks greater due to the influence of competing causes of death and over-diagnosis which reduces the gain from early detection (9) (10). However screening does result in the diagnosis of smaller, earlier stage cancers in older women (5) and roughly halves the mastectomy rate (11). In fact mammography has increasing sensitivity and accuracy in older women due to reduced breast density in this age group which reduces the number of false positives and unnecessary biopsies (12).

Health Care Professionals (HCPs) may be asked to advise about whether screening may be beneficial for an individual older woman. Evidence suggests that physician advice may be of variable quality. Studies in the USA suggest that women with chronic co-morbidity, who are likely to see HCPs regularly, are more likely to be advised to have mammograms (13). In another study, almost half of all women over 80 years referred for mammograms were in poor health and unlikely to benefit (14).

The UK NHSBSP currently screens routinely to age 70 and beyond this, places the onus for seeking screening mammography with the patient. The American Cancer Society (15) suggests no upper age limit but advises screening as long as the patient is healthy (16). The International Society for Geriatric Oncology (SIOG) recommends screening be available up to 75 with individualised decision making beyond this based on patient preference,

physiological age and life expectancy (17). In practice, this places the onus for decision making on the physician and such estimates of life expectancy can be difficult.

The present study examines the views of specialist HCPs towards screening in older women (>70yrs), the current screening system and to whom it should be offered. It draws upon summary findings from a quantitative survey as well as purposively selected qualitative interviews with HCPs. The questionnaire included a discrete choice experiment where HCPs were given 23 scenarios based around women of varying ages and health statuses and asked to state whether they would advocate screening. Their responses were analysed relative to predicted life expectancy of greater than 5 years (in line with SIOG and ACS recommendations).

The aims were to establish: whether HCPs are in favour of screening extension in the UK, to whom and how it should be offered and how accurately they can assess which women may benefit.

Materials and Methods:

Postal Questionnaire Survey

Research Ethics Committee approval was obtained. A postal questionnaire was designed, based on a literature review and expert opinion of the study group. It was mailed to HCPs with expertise in the field of breast cancer management or elderly care, identified from 3 sources:

- (1) The UK Association of Breast Surgeons (ABS) membership database, (n=200),
- (2) The British Society of Geriatrics (BSG) membership database (n=200),
- (3) Local HCP in the North Trent Health Region: Surgeons, Oncologists, Screening Radiologists, and General Practitioners and Breast Care Nurses (n=88).

No reminder was sent. The questionnaire comprised 4 sections:

- (1) Respondent demographics, (age, sex, occupation, experience).
- (2) Questions relating to factors influencing breast screening recommendation in the over 70s.
- (3) Statements about the current organisation of screening, with a Likert style grading of opinion.
- (4) A series of 23 hypothetical patient scenarios [Discrete Choice Experiment, (DCE)] (18), (19).

These 23 patient scenarios described hypothetical older women who had asked for advice about whether they should continue attending screening. By peer consensus, five variables were selected for inclusion. The variables included age group (50-70, 70-74, 75-80, 80-84 and >85), co-morbidity (none, mild, moderate, severe), functional status (independent, mild, moderate or severe dependency), cognitive function (normal, mild, moderate, severe impairment) and breast cancer risk factors (normal, raised). The questionnaire's 23 scenarios were randomly generated from the reduction of all possible combinations of the five variables levels generated by SPSS 'Orthoplan' software (640 potential scenarios) by

fractional factorial design (20). These scenarios were then categorised to place women into predicted life expectancy categories of <2, 2-5 and >5 years. Current opinion is that women with a predicted life expectancy of over 5 years may benefit from screening, whereas those likely to survive for <2 years may not benefit (21). The predicted life expectancy of each patient scenario was NOT shown to questionnaire respondents as this information would not be routinely available in normal practice.

Clinicians were asked to indicate their screening preferences for each scenario as either: for breast screening; not for breast screening; or undecided. Multinomial logistic regression (MLR), in STATA v11 (22), with robust standard errors to allow for clustering by respondent was used to look for associations between the screening preference and clinical characteristics (age, co-morbidity, breast cancer risk, functional status and cognitive function).

Qualitative Interviews

At the end of the questionnaire participants were asked if they would consent to be interviewed about breast screening in the over 70s. Interviews were digitally recorded and transcribed verbatim. Recruitment ceased once data saturation had occurred. Analysis followed the National Centre for Social Research 'Framework' approach to identify recurrent themes (23). A thematic index was drawn up and applied to the data. Data was entered into thematic charts and examined to allow interpretation of the data and to identify any relationships between themes.

Results

One-hundred and thirty-nine of the 488 clinicians approached returned completed questionnaires (29% response rate): 63% male, 37% female; 58% surgeons, 19% geriatricians, 9% general practitioners (GPs), 3.6% breast radiologists, 1.4% breast clinicians, 3.6% oncologists and 5% breast care nurses. The median age was 49 years (range 30 to 66) with a median of 26 years post-qualification experience (range 6 to 41). No reminder was sent.

Of these, 52 consented to be interviewed (37%) and 26 were invited to interview (selection applied to ensure all HCP types were represented and interviews discontinued once

thematic saturation had occurred). These included 11 breast surgeons, 3 geriatricians, 4 GPs, 3 radiologists, 3 breast care nurses, 1 oncologists and 1 screening radiographer.

The thematic frame categorised the data into four themes detailed below. The interview and questionnaire data are presented concurrently below and summarised in Figure 1 and Tables 1 and 2.

1. Views regarding breast screening in the over 70s.

HCPs were generally in favour of breast screening (non age specific). A total of 83% (115/138) felt screening reduced the death rate from breast cancer and 55% (76/138) agreed that screening was cost effective. Few, 8% (11/138) disagreed that screening was beneficial. (Questions 1.1 and 1.2 in Table 1).

With regards to screening older women, (questions 5.1-4, Table 1) opinion was mixed regarding whether women >70 derive as much benefit as women aged 50-69 (Q 5.1). The majority felt screening should only be offered to the age range where it was cost effective (63%, 87/138, Q5.3). However, there was also support for the idea that screening should be offered to any women over 50 if she was healthy enough to benefit, (68%,95/137, Q 5.2).

These mixed attitudes to screening in older women were based on several factors when explored at interview including the general principal of equality of access and patient choice, increasing life expectancy and fitness in older age and the progressive increase in breast cancer risk with older age (Table 2). However the effect of co-morbidity, frailty and cognitive decline were all viewed as important if HCPs were considering whether to advise continued attendance at screening and it was generally felt that if a woman was fit enough to benefit she should continue to be screened (Table 2). Age alone was not rated as highly as co-morbidity when considering whether to screen (Figure 1). Predicted life expectancy was rated as very important or important by 82% demonstrating HCP's appreciation that this reflects overall health status and the most likely predictor of screening benefit.

2. Benefits and risks of breast screening in older age

Both the interview and questionnaire data found almost all HCPS to have good knowledge of the benefits and risks of breast screening in older women. Most were aware that screening can over diagnose cancer (59%,81/138 Q2.1), can cause psychological distress (64%,88/138, Q2.3) and result in unnecessary diagnostic procedures (69%, 95/138Q2.2). The burden of 'over diagnosis' and false-positive results and the impact of treatment of screen detected cancers that would not necessarily have affected the woman during her natural lifetime were felt to be more pressing in the older age group.

Several HCPs held strong beliefs that screening should cease altogether when there were only marginal benefits to the woman, as it was neither cost effective or efficient and consequently 'over burdened' the service (Table 2). Older women with significant cognitive impairment, sufficient to render them unable to give informed consent should they need treatment, were one group where most HCPs would not recommend screening due to the marginal benefits.

3. Perceived awareness of the current system for referral

Most HCPs felt that the current system of voluntary self referral was not widely known among older women. The majority of HCPs felt that older women were less breast aware than their younger counterparts, (80%,111/139, Q4.1) and were unaware of self referral for screening, (59%, 82/138, Q4.2). HCPS also held the view that these women had poor knowledge about the benefits and risks of screening in older age and this impeded their ability to make an informed decision about screening (Table 2).

Several HCPs also talked about the potential difficulties of explaining the risks versus benefits of breast screening to this older age group, as well as the controversy regarding the factors to consider in this decision-making process. Several HCPs argued that it was not currently a political imperative to publicise and promote the availability of breast screening to older women for fear of being 'over burdened' in a system that was currently struggling to cope. Another concern was the perception that many older women mistakenly believe that because they were no longer invited to attend for breast screening, they inferred they must therefore no longer be at risk of developing breast cancer (Table 2).

However, several HCPs raised the issue that even if there was an increased awareness campaign with increased information about the availability and risks and benefits of breast screening in older age, this would have very little impact on

uptake as such literature is rarely read (Table 2). However this view may be overly negative as research has shown that educational initiatives do result in improved long term knowledge about screening in older women (24-25).

4. Views towards the current and preferred system for screening referral

The views of HCP about the current screening arrangements for the over 70s were explored and alternative strategies discussed. In general there was little support for any potential strategy suggesting a degree of uncertainty about the optimal system. The least favoured was a system of selective recall at the GPs' discretion with only 10%, (14/138, Q3.2) favouring this option. Similarly there was little support for the current system of self referral with only 35%, (48/136, Q3.4) agreeing with this system. The most support was for some form of selective recall for women who remain in good health and therefore likely to benefit, balanced by a mechanism for restricting harm in those at risk of harm (58/139, 42%, Q3.1).

The current system was viewed as working in favour of higher socio-economic groups; that women who continue to attend when reminders cease are drawn disproportionately from the 'better educated' rather than 'disadvantaged' sections of society (Table 2).

However, although several problems were identified with the current system of self referral, there appeared to be little enthusiasm for screening models where the age invitation was simply extended to 80 years, (22%,31/139, Q3.3). However applying selectivity was thought practically difficult to instigate. The model of GPs selectively advising screening older women raised concerns regarding time, capacity and workload issues (Table 2).

Without selectivity, concerns were for harms done to less fit women. With selectivity some commented that this just introduced an additional, unnecessary barrier to access (Table 2).

In summary, although HCPs were aware that there were currently several problems with the current system of voluntary self referral, namely access and uptake, there was no concordant opinion about how the system could be improved.

5. Discrete Choice Experiment Results.

The 139 responders answered all 23 scenarios. In 38.8% of scenarios responders' preference was for breast screening, 49.7% not for breast screening, and 11.5% undecided. Table 3 summarizes the results by scenario. Scenarios are displayed as individual rows. This highlights a lack of consensus in clinicians' preferences for some scenarios. An example is scenario 20 which describes a woman aged 80-84 with moderate co-morbidity, a raised breast cancer risk, moderate dependency and normal cognitive function. In this case, 41.7% of clinicians would prefer this woman to attend breast screening, 39.6% had a preference not for breast screening and 18.7% were undecided. Several other scenarios 'split' opinion (1, 4, 16 and 23) emphasizing the fact that in many cases clinicians would not give consistent advice and might benefit from guidance.

Table 3 also illustrates that some clinicians adhere rigidly to their preferences despite the national policy for screening patients in this age group. For example, clinicians retain their preference for not screening in scenarios 15 and 23, where patients are aged 50-69 but with poorer levels of functioning.

Responses were analysed across scenarios, to establish the impact of individual variables over clinicians' preferences for breast screening. A response of "undecided" was treated as the reference screening option and compared with "preference for breast screening" and "preference for not breast screening" using univariate and multivariate analysis.

All five variables (age, co-morbidity, breast cancer risk, functional status and cognitive function) independently demonstrated a statistically significant association with screening preference ($p < 0.001$). When all five variables were included a multivariate analysis the breast cancer risk variable was of marginal significance ($p = 0.061$). The results of the multivariate analysis with all five DCE variables are summarised in Table 4. The results show "preference for not breast screening" over "undecided," and for "undecided" over "preference for breast screening," correlated positively with increasing patient age, co-morbidity, functional dependency and cognitive impairment.

Consistent with current screening guidelines, patient age appears to exert the greatest influence over preferences. For example, other factors being equal, clinicians are over seventeen times more likely to prefer not to screen rather than being undecided, if a

woman is aged over 85, than if she is under 70 ($p < 0.001$). The DCE technique confirmed most clinicians' preferences are consistent with evidence-based screening guidelines. But in addition it permitted the discovery of several nuances: in particular how patient age, co-morbidity and function impact on clinicians' preferences. Clinicians increasingly prefer not to screen with increasing patient age, increasing levels of co-morbidity, and increasing functional impairment.

When clinician factors were incorporated into multivariate analysis alongside the other variables, clinician gender demonstrated some independent association with screening preferences with female HCPs half as likely as male HCPs to choose not to screen compared to being undecided (female vs. male clinician gender, relative risk preference for not screening vs. undecided 0.52, 95% CI 0.32-0.84, $p = 0.008$).

The majority of HCPs correctly selected women for screening in terms of their predicted life expectancy (if < 2 years life expectancy screening will probably be of no benefit, and if over 5 years, will probably be of benefit). However in some scenarios, where patients were in the normal screening age (50-69) but unlikely to survive for long (scenarios 15 and 23), a significant minority still advocated screening (26.6 and 41% respectively). Conversely, for some very healthy, much older women a significant minority would not advocate screening (scenario 1, 36.7% would not screen).

Discussion

The present study has provided valuable insight into the issues relating to screening in older women and how this is viewed by a range of UK health professionals working in the relevant disciplines of breast care and elderly care. The results must be interpreted with a note of caution due to the overall response rate of 29%. This partly reflects the fact that no reminders were sent out. The response rate varied by category of HCP with breast surgeons responding at a satisfactory rate (response rate of 39%) compared to a poor response rate in geriatricians (13%). It is likely that this reflects the fact that this group of professionals have little input into breast-related issues and probably felt that the questionnaire was of little relevance to their practice.

These data suggest that HCPs favoured offering breast screening to older women, but with some restriction based on likelihood of benefit. There were themes of fairness and equality of access, increased fitness and life expectancy, tempered by an understanding of the relative reduction in benefit and increased harms with increasing age. Whilst the questionnaire responses identified that HCPs did not rate age as the most important factor when asked directly but felt life expectancy was more critical, the discrete choice scenarios found age to be the most significant variable. The discrete choice scenarios did not specify the likely life expectancy of each hypothetical patient, information which was not made available to the respondents. It is therefore possible that had this information been available it would have been a more significant variable. It does suggest that HCPs feel that life expectancy is most closely related to age rather than co-morbidity and frailty, which may not be the case. This is further highlighted by the scenario responses where a younger but ill woman with a very short life expectancy generated a mixed opinion about screening as did a very fit woman in the oldest age group suggesting that age dominates the other variables.

In all screening programs there are several risks which must be balanced against the potential benefits. Importantly these include the inevitable distress and discomfort for those women who are recalled for what subsequently proves to be benign disease and the problem of diagnosis of disease that will not affect a patient's survival (9), (10). This issue becomes increasingly important in older women and is the reason why the majority of national screening programs have an upper age limit. Most HCP's recognise that the upper limit in the UK (currently 70 and to be extended to 73 years) may exclude many women who could benefit, but also that any further extension may increase the risk of harm to some women. The recommendation of SIOG for individual decision-making based on physiological age and life expectancy (17) , whilst theoretically supported was felt to pose practical difficulties. These related to the time and resource implications of such assessments in a health system which is tightly regulated financially (the UK National Health Service). Introduction of such a system for all older women would need to be cost effective which is unlikely to be the case in view of the increasing costs per life saved of screening in older individuals (26).

This study has increased our understanding of health care professionals' preferences for the extension of breast screening to older women. Older women themselves feel strongly that screening should be offered to all women regardless of age or health (27). However the majority of older women are unaware of any potential risks from screening (27) and so their preference for continued invitation is based on incomplete knowledge. Giving older women enhanced, informed knowledge of screening availability and its potential risks, with access to HCPs to discuss individualised needs for screening may be the optimal way to improve the present situation in the UK and be associated with less harm than simply extending the age range still further. This would be associated with financial costs but these could be kept to a minimum by engaging women themselves in the decision making process by providing more detailed information about screening benefits and harms and the fact that screening may not benefit women in poor health, who should consult their doctor to discuss their screening needs. Instead of being sent a screening invitation, women could be sent information to help them to consider whether to attend screening or not. Those in excellent health and who still wish to attend would thus be reminded to do so. All others would be directed to their doctor to discuss the risks and benefits of screening.

This would place some additional workload on HCPs to advise such women, (which raises concern amongst study respondents), but this work suggests that UK HCPs are generally skilled at identifying women who are likely to benefit from ongoing screening based on their age and health status. Previous studies have suggested that some HCPs find it difficult to advise against screening in those for whom screening would have little benefit, presumably as this would involve implying the futility of screening in the face of a significantly reduced life expectancy (28). This is a difficult and sensitive issue to discuss. However the present study was based on hypothetical patient scenarios which may not reflect actual practice. Whilst our data would suggest that on the whole HCPs would make accurate assessments of the appropriateness of ongoing screening, this would need to be tested in the clinical setting. Previous studies of actual screening advice by HCPs to older women have been less than encouraging. There is a tendency to advise screening to women who are seen

frequently by their doctors (13), usually because they are in poor health, rather than fitter women who rarely attend and a significant proportion, up to 50%, of older women referred for screening are deemed unlikely to benefit (14). It is therefore clear that any such system which relied in part on the views of physicians about who is suitable for screening would need to be clinically tested and clear advice and guidance would need to be available to HCPs to ensure appropriate advice was given. Such a system of informed choice supported by high quality HCP advice would potentially improve screening access and knowledge in older women, promote informed choice and reduce the harms of screening by selecting out women who might not benefit.

The UK NHS Breast Screening Programme is extending the upper screening age to 73 over the next 3 years following a decision by the UK Government in 2007 (29) in an attempt to improve UK cancer outcomes which lag behind European averages (2). This extension will be phased in across the UK by randomization, so some women will be offered screening in this age group, others not. This will permit valuable comparative data to be collected. In view of the lack of good quality data on the effects of screening in older women this data will be extremely valuable in addressing the issue of whether screening benefits older women. Further trials are needed to define the characteristics of older women who will no longer benefit and until such data are available, older women should be encouraged to make an informed choice based on the best available evidence about whether they wish to attend.

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Figure 1: Patient characteristics and their importance in shaping advice HCPs would give to older woman (>70) considering continued breast screening (N=139).

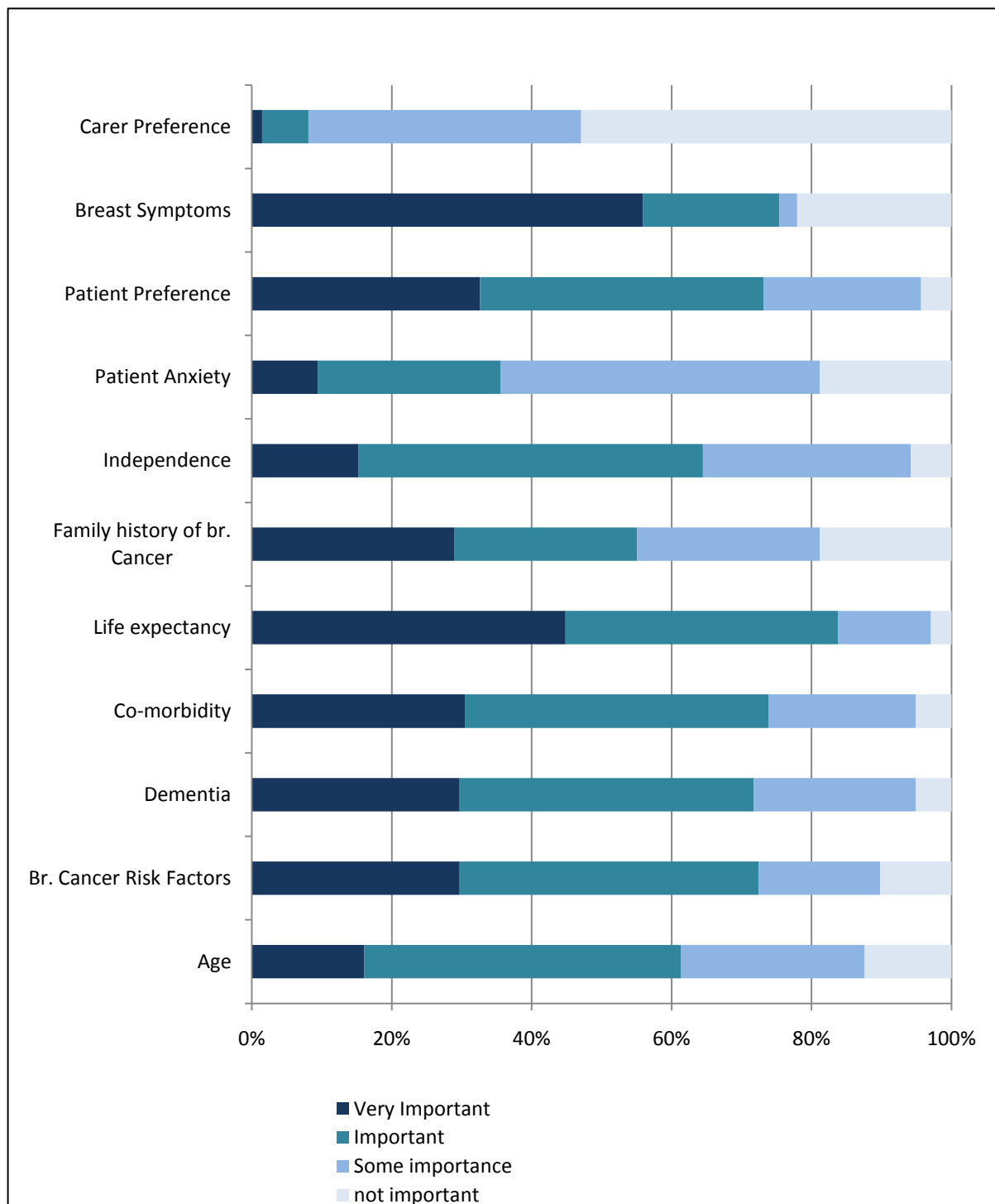


Table 1. Statements relating to HCP views on breast screening in older women (n=139).

	Statement	n	Disagree	Neutral	Agree
1	Statements relating to screening benefits				
1.1	The NHSBSP is a cost effective health promotion intervention?	138	8%	37%	55%
1.2	The NHSBSP reduces the death rate from breast cancer in the screened population?	138	1%	16%	83%
2	Statements relating to screening harms				
2.1	The NHSBSP may cause harm by over-diagnosing cancers/DCIS?	138	25%	16%	59%
2.2	The NHSBSP may cause harm by causing unnecessary diagnostic procedures?	138	23%	8%	69%
2.3	The NHSBSP may cause harm by inducing psychological distress?	138	22%	14%	64%
3	Statements relating to preferred screening organisation in the elderly				
3.1	There should be selective recall for women over 70 who remain in good health?	139	32%	27%	42%
3.2	Women >70 should be screened only if their GP thought it beneficial?	138	70%	20%	10%
3.3	Women should be invited for screening up to 80 regardless of health?	139	58%	19%	22%
3.4	The NHSBSP should maintain voluntary self referral for the >70s?	136	43%	22%	35%
4	Statements relating to screening knowledge in the elderly				
4.1	Women over 70 years are more breast aware than younger women?	139	80%	16%	4%
4.2	Women > 70 are aware that breast screening is by self referral?	138	59%	20%	21%
5	Statements relating to screening age range				
5.1	Women >70 may not benefit from screening as much as women aged 50-69?	139	37%	17%	47%
5.2	All women over 50 should be offered screening if healthy?	137	19%	12%	69%
5.3	Screening should only be offered to age range where cost effective ?	138	18%	19%	63%
5.4	All women > 50 should be screened regardless of age ?	128	36%	11%	53%

Table 2. Table summarising the themes from the qualitative health care professional interviews with sample quotes.

Theme	Health Care Professional Interview Quote
Views regarding breast screening in the over 70s	
Equality of access	<i>"I really don't think it should be up to individual clinicians to say whether a woman should be screened". (GP)</i>
Cost effective	<i>If we are giving the option of something unproven, and potentially unnecessary, we are diverting resources away from, say, physiotherapy for stroke patients. (Geriatrician)</i>
Screening should benefit the woman screened	<i>Those involved in breast screening should have the right to cease a woman from screening [if she won't benefit]. At the moment we don't have that privilege. (Radiologist)</i>
Resource issues of screening more older women	<i>The screening units are fairly much at capacity and unless they put more resources into it, it would be difficult to screen many more (Breast Surgeon).</i>
Increased life expectancy	<i>As life expectancy goes up then probably the screening age ought to mimic it. (Breast Surgeon). 75 is the new 65 (Radiologist)</i>
Increased breast cancer risk with age	<i>Age is the biggest risk factor (Breast Care Nurse)</i>
Predicted life expectancy	<i>Certainly if they are unfit and have limited life expectancy, then it's inappropriate, but if they are totally fit and got another 15- 20 years you can't justifiably turn them down (Breast Surgeon)</i>
Co-morbidity level	<i>I think anybody who is fit for treatment should be screened. (Geriatrician)</i>
Cognitive function	<i>Consenting to the screening process includes being able to understand the consequences of a diagnosis of cancer. I think if they can't consent we shouldn't make them come. (Radiologist)</i>
Patient preference	<i>Quite a lot of elderly patients ask if they can come back for screening when it ceases (Radiologist).</i>

Benefits and risks of breast screening in older age.	
Over diagnosis of cancer	<i>Yes we may over diagnose and we do... But if we leave that low-grade DCIS there is no guarantee that it will not progress to high-grade and then invasive disease. So my feeling is that we will cause some psychological benefit by the tests that we do to a small proportion of women (Radiologist).</i>
Psychological distress	<i>If you have picked up a very small cancer in a very old lady who is frail and may shortly die from a heart attack then you are not really going to have done her any favours by taking her breast off ... All you will have done is distress her enormously and caused a lot of pain (Breast Surgeon)</i>
Unnecessary diagnostic procedures	<i>We are looking for smaller and smaller lesions, we are picking up little bits of micro calcification, we are bringing women back for repeat biopsies ... for the detection of smaller and smaller lesions that may never even have been invasive cancer. And even if they had been invasive cancer they might never have threatened their lives (Radiologist).</i>
Patient awareness of breast cancer and screening	
Poor awareness of voluntary self referral	<i>I don't think a lot of older women realise that they are more at risk of developing breast cancer ... and I think women should know that it is freely available. (Radiologist)</i>
Reduced breast awareness in older women	<i>A misconception that some of the elderly women have is that once they have got to 70, if they haven't developed breast cancer, they are unlikely to. And I see that quite a bit. Education there is failing them, obviously their risk is increasing (Breast Surgeon).</i>
Low impact of screening literature	<i>It doesn't matter how many leaflets you send out, because people don't read them. (Radiologist)</i>
Poor patient knowledge of screening risks	<i>I don't think that that people should just be sent for the screening programme without understanding the benefits and risks ... I think there needs to be ... counselling, bit of discussion. So that they can make an informed decision about whether to go (Breast Care Nurse)</i>
Believe themselves at low risk of breast cancer.	<i>They think that because they were told they wouldn't be sent for anymore, they don't need screening anymore. (Breast Surgeon)</i>

Preferred system for screening referral	
Current system may favour higher socio-economic groups	<i>I think it's not necessarily the women who most need screening who are the ones who get it, it's the ones who are aware of it, who are more educated, more well read who are then able to access that service. (GP)</i>
Selective recall for healthier older women	<i>You think 'maybe I shouldn't be ageist', then 'maybe I shouldn't be illnessist'. It is a very difficult decision. You can't invite a woman but say 'if you are seriously ill with another condition don't bother coming' because that is going to cause some significant anxieties about their other medical conditions (Breast Surgeon).</i>
Selectivity a barrier to access.	<i>Why put another barrier in the way. We would want to make it as easy access as possible. (Radiologist)</i>
Current system flawed	<i>Is the uptake of screening less in the over 70's because they have to initiate it themselves? Undoubtedly yes. Will a large number forget to arrange it? Almost certainly yes. So for our own programme, the proportion screened over the age of 70 is much, much smaller than the proportion of the population below 70. So if you are saying screening over 70 is good, does the current system encourage that? Not particularly (Breast Surgeon).</i>
Time, capacity and workload issues of HCP input into selective invitation	<i>Our workload in general practice is getting more and more. I'm certainly reticent about putting in another visit to the GP to discuss something like that. (GP)</i>

Table 3: Observed frequencies from HCP survey for 23 scenarios - three outcomes (N=139)

Scenario	Patient age (years)	Co-morbidity	Breast Cancer Risk	Functional Status	Cognitive Function	Estimated Life Expectancy In Years#	Preference for Screening %	Preference for not Screening %	Undecided %
1	80-84	None	Raised	Fully independent	Normal	>5	46.8	36.7	16.5
2	70-74	Moderate	Raised	Fully independent	Normal	>5	85.6	7.9	6.5
3	75-79	Mild	Normal	Moderate dependency	Severe impairment Moderate	<2	7.9	79.1	12.9
4	70-74	None	Raised	Mild dependency	impairment	2-5	42.4	37.4	20.1
5	50-69	None	Raised	Mild dependency	Mild impairment	>5	93.5		6.5
6	80-84	Severe	Raised	Moderate dependency	Severe impairment Moderate	<2	2.9	93.5	3.6
7	75-79	Moderate	Normal	Mild dependency	impairment	2-5	21.6	62.6	15.8
8	85+	Moderate	Normal	Moderate dependency	Mild impairment	<2	10.1	82.0	7.9
9	75-79	None	Raised	Mild dependency	Normal	>5	74.8	13.7	11.5
10	85+	Severe	Normal	Mild dependency	Normal	<2	7.9	87.8	4.3
11	50-69	Mild	Normal	Fully independent	Normal	>5	97.1	1.4	1.4
12	50-69	None	Normal	Fully independent	Normal	>5	95.7	2.2	2.2
13	70-74	Severe	Normal	Severe dependence	Normal Moderate	<2	13.7	74.8	11.5
14	80-84	None	Normal	Fully independent	impairment	<2	24.5	57.6	18.0
15	50-69	Moderate	Raised	Severe dependence	Severe impairment	<2	26.6	56.8	16.5
16	80-84	Moderate	Normal	Mild dependency	Normal	2-5	33.8	51.8	14.4
17	70-74	Mild	Normal	Fully independent	Mild impairment Moderate	>5	74.8	10.8	14.4
18	85+	Mild	Raised	Severe dependence	impairment	<2	7.2	86.3	6.5
19	75-79	Severe	Raised	Mild dependency	Mild impairment	2-5	24.5	61.9	13.7

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20	80-84	Mild	Raised	Moderate dependency	Normal	2-5	41.7	39.6	18.7
21	70-74	None	Normal	Moderate dependency	Severe impairment	<2	14.4	66.9	18.7
22	85+	None	Normal	Moderate dependency	Severe impairment	<2	3.6	93.5	2.9
23	50-69	Severe	Normal	Moderate dependency	Moderate impairment	<2	41.0	39.6	19.4

#The predicted life expectancy of each patient scenario was NOT shown to questionnaire respondents.

Table 4. Influence of all five DCE variables over preferences for breast screening (N=139)

Preference	Factor	Level	Relative Risk	P-value	95% CI	
Not for screening vs. undecided	Breast Cancer	<i>Normal</i>	1.00			
	Risk	<i>Raised</i>	0.91	0.501	0.68	1.21
	Patient	<i>50-69</i>	1.00			
	age (years)	<i>70-74</i>	2.49	<0.001	1.61	3.83
		<i>75-79</i>	3.84	<0.001	2.32	6.35
		<i>80-84</i>	4.93	<0.001	2.84	8.56
		<i>>85</i>	16.04	<0.001	9.00	28.60
	Co-morbidity	<i>None</i>	1.00			
		<i>Mild</i>	0.95	0.755	0.69	1.31
		<i>Moderate</i>	1.57	0.004	1.16	2.13
		<i>Severe</i>	3.24	<0.001	2.16	4.88
	Functional	<i>Fully Independent</i>	1.00			
	status	<i>Mild dependency</i>	1.03	0.870	0.71	1.49
		<i>Moderate dependency</i>	1.05	0.797	0.71	1.57
		<i>Severe dependence</i>	1.61	0.084	0.94	2.76
	Cognitive	<i>Normal</i>	1.00			
	function	<i>Mild impairment</i>	0.79	0.102	0.60	1.05
		<i>Moderate impairment</i>	1.40	0.065	0.98	1.99
		<i>Severe impairment</i>	3.25	<0.001	2.09	5.04
For screening vs. undecided	Breast Cancer	<i>Normal</i>	1.00			
	Risk	<i>Raised</i>	1.22	0.153	0.93	1.59
	Patient	<i>50-69</i>	1.00			
	age (years)	<i>70-74</i>	0.27	<0.001	0.18	0.41
		<i>75-79</i>	0.23	<0.001	0.14	0.38
		<i>80-84</i>	0.10	<0.001	0.06	0.17
		<i>>85</i>	0.22	<0.001	0.10	0.46
	Co-morbidity	<i>None</i>	1.00			
		<i>Mild</i>	1.29	0.119	0.94	1.76
		<i>Moderate</i>	1.00	0.989	0.75	1.34
		<i>Severe</i>	0.54	0.013	0.34	0.88

Functional status	<i>Fully Independent</i>	1.00			
	<i>Mild dependency</i>	0.68	0.021	0.49	0.94
	<i>Moderate dependency</i>	0.42	<0.001	0.28	0.62
	<i>Severe dependence</i>	0.23	<0.001	0.13	0.39
Cognitive function	<i>Normal</i>	1.00			
	<i>Mild impairment</i>	0.49	<0.001	0.36	0.66
	<i>Moderate impairment</i>	0.30	<0.001	0.21	0.43
	<i>Severe impairment</i>	0.19	<0.001	0.11	0.34

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