General practitioners’ (GPs) understanding and views on breast density in Australia: a qualitative interview study

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ABSTRACT

Objectives To understand general practitioners’ (GPs’) awareness and knowledge of mammographic breast density (BD) and their perspectives around information and potential notification of BD for women.

Design Qualitative study using semistructured telephone interviews. Interviews were audiorecorded, transcribed and analysed using framework analysis.

Setting Australia.

Participants Australian GPs (n=30).

Results GPs had limited knowledge of BD and little experience discussing BD with women. There were mixed views on notification of BD with some GPs believing this information would help informed decision making about breast health and that women have the right to know any information about their bodies. While others were concerned about causing unnecessary anxiety and were worried about the uncertainty about what to advise women to do with this information, particularly in relation to supplemental breast screening. The need for an equitable system where all women are either notified or not, and also provided with publicly funded supplemental screening was raised by GPs. Overall, there was high interest in education, training and support around the topic of BD.

Conclusions Australian GPs require education, support and evidence-based guidelines to have discussions with women with dense breasts and help manage their risk, especially if widespread notification is to be introduced in population-based screening programmes.

INTRODUCTION

Breast density (BD), as measured on a mammogram, is the relative amount of fibrous and glandular tissue in a woman’s breasts compared with the amount of fatty tissue. BD is classified into four categories1: (A) almost entirely fatty, (B) scattered areas of fibroglandular tissue, (C) heterogeneously dense and (D) extremely dense, with categories C and D being classified as ‘dense.’ BD is one of a number of independent risk factors for breast cancer2 and current estimates are that 40% of women in the breast screening population have dense breasts,3 making it one of the most common risk factors. Furthermore, through its masking effect, dense breast tissue lowers the sensitivity of mammography which can increase the chance of cancer going undetected.4,5

The notification of BD been a topic of international discussion for some time, particularly in the USA.6 In 2020, the US government introduced a legislative requirement that women be routinely notified of their BD following mammography.7 This has escalated concern about the issue in the scientific and broader community,7,8 particularly given concern that evidence supporting widespread BD notification is weak, and—for any individual woman—the balance between potential benefits and harms of notification is unclear.9 There are no uniform recommendations for women with dense breasts in regard to supplemental screening. This is due to very limited evidence for any benefit in long-term outcomes such as advanced breast cancer incidence and mortality.10,12
Irrespective of this, US women who receive a BD notification are often advised to follow-up with primary care practitioners (PCPs) including general practitioners (GPs). In countries outside the USA, widespread BD notification does not occur. However, given the US legislation and growing pressure from consumer advocacy groups to notify women about their BD, countries with population-based screening programmes are contemplating what to do.

To date, there have only been a handful of studies on GPs’ understanding and views on BD, all conducted in the USA during or following the introduction of BD legislation. No data are available from other jurisdictions. The aim of this study was to understand Australian GPs’ awareness and knowledge of BD and their perspectives around information and notification of BD, in a country where notification is not legislated. The BreastScreen Australia population screening programme invites women aged 50–74 years for free biennial mammography, and does not routinely record BD or provide supplemental testing for women with dense breasts. However, one state (Western Australia, WA) does notify women and their GP of BD, as do most private screening providers, and some consumer advocacy groups have generated public awareness campaigns and lobbied for broader notification policies. As many other countries with breast cancer screening programmes are at a similar point in the development of BD policy, understanding Australian GPs’ approaches may assist in developing communication strategies for GPs and other PCPs in countries where widespread notification is not (yet) in place. The objective of this study is therefore to explore GPs’ understanding and views on BD in Australia.

METHODS

Design
This qualitative study used semistructured telephone interview method.

Patient/public involvement
Two consumer representatives from Breast Cancer Network Australia and Health Consumers New South Wales, respectively, were involved in advising team’s BD research stream. However, they were not directly involved in developing study materials, conducting the interviews, analysing the data and reviewing of manuscript for the current GP study.

Sample and recruitment
The sample included GPs currently practising in public and private settings throughout Australia. We used a purposive sampling strategy and pursued to recruit GPs with diverse characteristics, including those with or without a special interest in breast medicine, from different Australian states and rural or urban localities. Potential GPs initially were selected among self-referrals. GPs were recruited through several avenues including: (1) an email, with Participant Information Statement (PIS) attached, to the Royal Australian College of General Practitioners Breast Medicine Special Interest Group mailing list, (2) an email, with PIS attached, to a list of GPs who had consented to be contacted for future studies after participating in previous University of Sydney research and (3) a brief study advert on the ‘GPs Down Under’ Facebook group page, an online community page for Australian GPs with more than 8000 members. All avenues included study investigators’ details. GPs contacted researchers (BN or HD) directly to express interest in participating and arrange an interview. On contact, the interviewer verbally explained the study and answered any participant questions. Written consent was obtained from each participant before the interview. ‘Snow-balling’ recruitment technique, whereby participants forwarded study information to eligible colleagues, was also used. Recruitment continued until preliminary analysis suggested thematic saturation, that is, existing themes were consistently adequate in capturing recurring patterns in the participants’ accounts, indicating saturation of key themes. The data saturation was agreed on by team members who engaged in continuous monitoring of data and discussion of the process. All GPs were compensated with a gift voucher ($A100) for their time.

Data collection
The semistructured telephone interview schedule (see Box 1 for a list of overarching topics and online supplemental appendix 1 for full interview schedule) was developed by a multidisciplinary team of public health and medical researchers, a GP, breast physicians and psychologists. The interview schedule was piloted with two GPs and revised accordingly.

Interviews were conducted over the telephone by two public health researchers with experience in qualitative methods (BN and HD) between June and July 2020. Interviews lasted 20–51 min and were audiorecorded, then transcribed verbatim by a professional transcriptionist. As the interviews were being conducted, the two researchers continually met to discuss the data and
themes arising. This helped to form the initial familiarisation process of the data and to inform the analysis structure.

### Analysis

We conducted a Framework Analysis, using Excel to organise the data. Framework analysis is a matrix-based method which uses a spreadsheet for organising and charting data. This method allows for easy comparison of data by cases (rows) and by codes (columns). This method was chosen for data analysis because it allowed for systematic reduction and structured analysis of data, which assists with team collaboration and transparency, while allowing for flexibility in accommodating emergent themes or reflective enquiry. BN and HD reviewed transcripts and developed a list of topics and themes identified, with reference to notes made continuously throughout the interview process. Those topics (overarching themes) and subthemes, along with the interview schedule, formed the basis of the coding framework (see online supplemental appendix 2). One additional researcher (KM) reviewed the coding framework, and changes were discussed and made accordingly. Once a framework was agreed on, HD coded all interviews, and summarised the coding of each interview into the framework in Excel. BN double-coded six (20%) interviews to ensure the framework was adequately capturing the data. Transcripts were coded deductively when the explicit meanings of the text segments were mapped onto the themes/subthemes in the priori coding framework. Data was coded inductively when the text segments reflected new or interesting perspectives, allowing for the coding framework to be revised iteratively. Any coding differences between the two researchers were discussed and re-assessed. During the coding process and again once coding was complete, BN and HD examined the framework chart to interpret the findings, which were discussed with the entire research team.

The trustworthiness and rigour of data analysis were established by: engaging with data for a prolonged period of time; keeping reflective notes throughout the data collection and analysis to record evolving impressions of the data and the course of our analytical thinking; double-coding a subportion of the transcripts; frequent debriefing with multidisciplinary team members; and using a matrix-based analysis method which allowed for thorough documentation and version control (audit trail) of data coding and theme development.

### RESULTS

Participant characteristics are outlined in table 1. Most participants were female, had less than 10 years’ experience and worked in urban centres. There was a mix of GPs who worked at public, private or both types of clinics. Participants indicated diverse special interest areas, with 11 GPs having a special interest in women’s or breast health.

The study findings are organised into five main themes, some with subthemes. Participant quotations are incorporated to illustrate GPs’ views and experiences. We noted important differences between GPs with a special interest in women’s or breast health (subsequently referred to as ‘special interest GPs’ and marked with asterisk *) and those without (‘non-special interest GPs’), and also

| Characteristic | No of participants (n=30) |
|---------------|--------------------------|
| Years of experience (YE) | |
| <10 | 17 |
| 10–19 | 5 |
| 20–29 | 3 |
| 30+ | 5 |
| Type of practice | |
| Public | 10 |
| Private | 10 |
| Both | 10 |
| Location of practice | |
| Urban | 24 |
| Rural | 6 |
| State | |
| New South Wales | 11 |
| Victoria | 7 |
| Queensland | 5 |
| South Australia | 4 |
| Western Australia (WA)* | 3 |
| Sex | |
| Female (F) | 23 |
| Male (M) | 7 |
| No of patients managed/week† | |
| <50 | 5 |
| 50–99 | 14 |
| 100+ | 11 |
| Proportion of female patients aged 40+† | |
| <30% | 7 |
| 30%–59% | 16 |
| 60%–89% | 5 |
| 90%+ | 2 |
| Special interest in women’s or breast health† | |
| Yes | 11 |
| No (other or no special interest reported) | 19 |

*State which currently notifies women of their BD through the population-based screening programme (BreastScreen WA).
†Self-reported.
between GPs from WA (where BD notification occurs) and other states. The results discuss these differences throughout.

Knowledge of BD

Most GPs knew very little about BD. The minority of GPs who did know about BD were more likely to have a special interest in women’s health or breast medicine.

The main source of knowledge about BD for GPs came from mammogram reports, with all GPs from WA and a minority of GPs who had received reports from radiology services indicating seeing information about BD on mammogram reports. A number of GPs (with various characteristics) also discussed hearing about BD through professional conferences or talks given by radiologists or breast specialists.

While most participants (especially non-special interest GPs) stated that BD was not covered during medical education or training, a few did describe briefly hearing about it. There was no pattern in specialty, GP location or recency of training in determining this.

…and we haven’t had any sort of education that I know about where they advise GPs what to do… we know about the screening stuff, how to manage a breast lump or a clinical breast symptom. But I don’t think there’s been much education around breast density. (GP21, F, <10YE)

Overall GPs had limited knowledge of the implications of BD for women. For many, knowledge was limited to younger women having denser breasts and therefore being more likely to be recommended ultrasound over mammogram. Some GPs indicated some level of understanding of how BD can mask cancer on the mammographic image.

…and increased breast density, there’s more sort of glandular connective tissue in the breast and it can make it a bit more difficult on mammogram to detect changes or cancers. (GP20, F, <10YE)

There was also very limited understanding of BD being an independent risk factor for breast cancer.

I didn’t know that was a risk factor. I’ve never known that. No one’s ever told me that. All the guidelines I’ve looked at I’ve never seen that… (GP7, M, 30+YE)

Most non-special interest GPs perceived their own level of understanding of BD as inadequate or very basic, citing reasons such as being unaware of its clinical significance, BD not being reported on screening reports or included in guidelines, or breast screening making up a very small part of their practice.

…and until this interview I didn’t know that there really was anything particular to understand, other than the fact that people with dense breasts needed ultrasounds instead of mammograms, or, as well as mammograms, to pick up their cancers. So I didn’t really feel that it was an issue…. (GP4, M, 30+YE, WA)

A few GPs also believed that clinical breast nodularity detected by physical examination of the breasts (lumpy, hard or dense) was the same as mammographic BD.

Views on current landscape of BD notification in Australia

GPs’ comments on the current landscape of BD notification in Australia mainly revolved around the divides between public and private patients and the practice in WA versus other states. Some GPs felt that not telling women their BD in the public system creates a ‘two-tiered’ system and there should be a uniform recommendation. Others felt it is ‘very complicated’ or ‘a mess’ to have different guidelines across different Australian jurisdictions, or women’s ‘right to know’ should not depend on where they live.

…it would be good if there was a general rule, either we do it or we don’t do it, rather than people thinking they have an inadequate screening because the private place they can get it graded but at a public BreastScreen, they can’t. (GP18, F, <10YE)

While having concerns about the ununiformed approach to notification in Australia, the majority of GPs expressed that BreastScreen Australia’s decision to not routinely record BD or provide supplemental screening for women with dense breasts must have justification to it, given it is based on the latest evidence. They considered that given the uncertainties surrounding the implications of BD and notification, the lack of solid evidence, and not having an equitable way of dealing with financial and logistical implications of notifying women, the decision of BreastScreen Australia sounded reasonable.

I don’t think it’s fair to tell someone something that they’re at high risk but we have no way of dealing with it with you, if you tell someone who has no money that they’ve got a high risk of developing, a higher risk of developing breast cancer than their neighbour… but we can’t find that for you because we can’t screen you more than every two years and we can’t give you a free ultrasound and all that sort of stuff, I don’t think that’s fair. (GP9*, F, 10–19 YE)

A few however felt strongly about women’s right to know and commented that BreastScreen should at least let the doctor know.

I think then it’s a medical and patient decision. Not like a government decision, it’s difficult, ‘cause I don’t know like what the costs of that would be. Overdiagnosis is something that we have to think of. But I still think people need to, we have the right to know. (GP23, F, <10YE)

There was no pattern in the views held among special interest and non-special interest GPs or those from different states.
With regard to consumer campaigns on BD information in Australia, some GPs viewed them in a positive light, commenting that campaign messaging helped women become more aware and proactive towards their breast health. They, however, cautioned that GPs would need to be prepared with information and skills to respond to women’s inquiries and direct them to appropriate resources. Other GPs had concerns as they perceived that consumer campaigns could potentially lead to overscreening and create anxiety and confusion among women, with some women potentially equating BD to breast cancer.

I think they can be quite dangerous as well, because they can frighten women maybe unnecessarily. It’s better coming from their healthcare professional than from media campaigns that are unregulated. (GP5, F, <10YE)

Views on informing women of BD
There were varied opinions among all GPs in terms of the notion of specially notifying all women during population screening or on an individual basis, citing various reasons and concerns.

Specific views on notifying all women of their BD during population screening
Some GPs were not supportive of informing women at a population level because ‘we don’t know yet what to do if women are found to have dense breasts’. Most of those GPs preferred an individual-based approach to notifying women of their BD, based on other risk factors, rather than notifying all women during population screening. Some GPs discussed the importance of GPs (rather than patients) being informed about BD to enable them to better advise women and take it into account in relation to their overall risk. Other GPs saw it as unimportant and thought women ‘would not be particularly interested’.

For those GPs who were supportive of population-level notification, their main argument was that notifying all women might benefit those with dense breasts, would lead to overscreening and create anxiety and confusion among women, with some women potentially equating BD to breast cancer.

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Reasons why women should be informed
Similar to views expressed about population-level communication, GPs who supported notifying individual women about their BD usually argued that women should be able to make informed decisions.

I’m always in favour of letting the patient know all the information that we have available. And particularly because if there’s a known risk to developing breast cancer I certainly would want the patient to have that information, so that they can make an informed decision about screening intervals and the importance of screening in the future. (GP29, M, <10YE)

GP in favour of informing women also commonly asserted that knowing their BD and its implications would make women more proactive and vigilant towards their breast health. Some felt that the information would give women a realistic idea of their risk and might also provide extra impetus for women to get regular screening or choose an appropriate screening interval or modality.

Others suggested it is wrong to withhold information about increased risk, and stressed women’s right to know, the importance of being open with women, even with the substantial uncertainties.
I guess the patriarchal thing is the best way I can think of it. Like not having some Big Brother looking after me by going, oh I know this but it’s just going to confuse you so I won’t tell you… I think it’s important because I think if women feel like information is being withheld, then that impacts on the trust as well. (GP10, F, <10 YE, WA)

Some emphasised the importance of proper discussion and explanation of BD to women, as they argued if women are given the right amount of information and it is explained well, it will not necessarily cause anxiety.

…if we can make them understand and with the right words, and also give them out the information what they have to know, instead of giving too much information is going to definitely increase their awareness and reduce their anxiety about the problem. (GP1*, F, 10–19 YE)

One GP from WA where women are routinely notified of their BD through publicly funded BreastScreen programme commented on the letter that women receive after their mammogram and stressed the importance of the BD information being communicated by an informed GP.

…a lot of women I find don’t understand the letter that they get from BreastScreen. And they either think it means nothing and everything’s fine or they don’t need to do anything, or they freak out that they’re high risk ‘cause they’ve gone and Googled it… So I think it’s useful as a doctor for me to know, and then for me to discuss it with the patient, rather than… trying to explain it all via the letter. (GP10, F, <10 YE_WA)

Concerns about informing women of BD
The main concern GPs expressed about informing women of BD was that doing so might cause some women undue anxiety. This reflected their reservations about the fact that BD is not modifiable, uncertainties in how much of an increased risk it confers and having no clear guidelines on what to do next.

…the cons is that introducing another level of complexity that maybe people don’t understand or makes them more worried, there isn’t I guess the concrete guidelines how they’re meant to manage it. So, it could cause more anxiety I suppose for people, if there isn’t clear advice on it. (GP20, F, <10YE)

GPs were concerned that telling women about increased risk might cause them financial costs for extra examinations and might lead to overscreening, overdiagnosis or increased radiation exposure.

Perceived challenges to communicating BD information
While two-thirds of participants claimed to have had experience discussing BD with women, often in the case of non-special interest GPs, BD was briefly mentioned within the context of explaining the modality of imaging for younger women or when it was reported on mammogram results. GPs without experience discussing BD with patients explained that none had asked about it, and they had not seen it on mammogram reports. Some also acknowledged that their own lack of knowledge of the implications of BD could have contributed to this conversation having never come up.

GPs who had experience discussing BD said this was challenging, as BD is an abstract concept that is hard to explain and poorly understood by women, especially by those with low educational and health literacy levels. While some GPs used visual aids to overcome this challenge, others worried that if they explained it poorly, this might increase women’s anxiety or lead to misinterpretation.

…they can’t feel it, they can’t see it, unless they Googled an image of high breast density on a mammogram it can be difficult for them. (GP5, F, <10YE)

Lack of knowledge was also cited as a barrier to communication, along with how to discuss the costs associated with supplemental screening (ie, that it is not publicly funded), discrepancies between radiology reports and GP guidelines, lack of time, uncertainty in evidence, and needing to use interpreters with people who do not speak English.

I’m happy enough to say, look you’ve got more dense breasts, you have more connective glandular tissue. It can make it harder to see cancers, but I think it [the guidance] is not clear on telling them what to do from there. (GP20, F, <10YE)

GPs views on patient information materials were mixed, but many emphasised that the key was to have an informed GP who can explain BD clearly.

I think mainly your GP would have to really understand it and that GP can use their own language to explain to a patient, rather than you just have a formal sheet. (GP2*, F, 10–19 YE)

Information and communication needs of GPs
GPs who had little knowledge and experience of BD expressed their desire to learn more. Generally, GPs highlighted the need for more evidence on BD and associated breast cancer risk, benefits and harms of BD notification and supplemental screening, and analysis of cost-effectiveness. They also stressed the need for clear guidelines or protocols regarding further investigation and advice on breast screening if women are found to have dense breasts. Promoting BD knowledge among GPs, enhancing research communication to GPs, and a wider discussion between experts and stakeholders were also proposed as important future directions.

I guess it would be good to have a resource where you could go, ok, you’ve got increased breast density, what does this actually mean for the patient? And
then...the advice would be just to screen, counsel the patient on risks for breast cancer and modifiable risks, or do I change anything about their management? (GP24*, F, <10YE)

DISCUSSION

Globally there has been increasing discussion of BD, including public messaging, post-legislation of BD notification in the USA. This study found that Australian GPs felt that they had a low level of knowledge about BD, particularly in relation to it being a risk factor for breast cancer. Although GPs with a special interest in women’s or breast health and those from WA (where BD information is provided in mammogram reports through the state-based screening programme) felt that they had higher levels of knowledge, important gaps in understanding still existed and there were concerns expressed by GPs about how to communicate BD information to women. Importantly, findings are similar to those from studies of PCPs conducted in the USA, where BD notification has been legislated and where women have more awareness of this issue.13–17

In Australia, there is currently no formal training or guidelines about BD for GPs, but there has been some advocacy to notify women of their BD. GPs in this study indicated an overall willingness to receive further information and training in relation to BD, including how to discuss the implications of BD with women. BD information would therefore need to be implemented as part of GP training and in clinical management guidelines. Despite their interest in this information, GPs had mixed views about informing women at a population level and the implications this may have for both women and clinical practice. GPs who supported more widespread notification believed this information would help women make more informed decisions about their breast health and that no information about one’s health should be withheld. Similar views have been expressed by Australian GPs in the context of PSA screening.25 In studies from USA and South Korea, women who knew their own BD level were found to be more likely to intend to complete mammogram in the future.24 25 The main concern displayed by GPs in this current study was that this information may cause unnecessary anxiety and supplemental screening. GPs who expressed this view were concerned about the fact that BD is not modifiable, uncertain about how much of an increased risk BD would confer for individual women, and troubled about not having clear guidelines to inform women what to do next. The latter point is core to the controversy about BD notification—whether or not to offer supplemental screening and if so, what type and how often.26 Given the limited consensus in this area12 and lack of current guidelines, supplemental screening recommendations for women with dense breasts would currently be left to the discretion of the GP. Before and after any such guidelines exist, GP training and discussions should be directed around how to discuss women’s individualised risk factors for breast cancer, inclusive of BD, the value of breast cancer screening in relation to risk level, and the possible benefits, harms and trade-offs for women with high BD in regard to options for supplemental screening. Such GP training could be delivered via continuous professional development programmes, conferences or workshops, online or in-person learning modules, and specialist lectures or seminars. Given the recent data has shown that there is no difference in screening mammography attendance in rural and urban areas in Australia,27 GP training in BD discussions could have broader implications nationwide.

GPs supported the decision by BreastScreen Australia18 to not routinely record BD or provide supplemental screening for women with dense breasts, given the uncertain evidence to support widespread BD notification. GPs also felt that BD notification may be an ethical issue if there is no publicly-funded supplemental screening, and that the current divide between public and private creates a two-tiered system. The belief that everyone should have the same knowledge and access to whatever the guidelines recommend was perceived by GPs to be a key part of the health system in Australia.

This study has both strengths and limitations. To our knowledge this is the first study seeking to understand GPs’ views on BD outside the USA. Findings provide important and timely insights into GP perspectives and the challenges PCPs may face when discussing BD. Some countries are considering whether or not to notify women through population-based screening programmes given recent events in the USA and growing pressure from consumer groups pushing the ‘right to know’.28 Although knowledge and views of GPs in other countries may vary, they are likely to be broadly similar in countries where there is no widespread notification process. Surprisingly though, recent studies in the USA have also shown similar findings.13–17 A substantial proportion of the GPs in this sample had a special interest in women’s health, therefore among the broader GP population the lack of knowledge may actually be greater and there may be less understanding around the potential implications of widespread BD notification. As GPs were initially recruited by self-referral, the GPs in this study may not be representative of all Australian GPs. In particular many participants were from urban areas, of female gender and had relatively short duration of clinical experience. Study results should be interpreted in light of the participant characteristics. However, a strength of our recruitment was the ability to compare GPs with and without special interest in women’s or breast health. All interviews were conducted over the phone, which may have had disadvantages in terms of visual cues. However, current evidence comparing the data collected from phone interviews and face-to-face interviews suggest that these two methods can be equally productive and valid in producing rich data.28 29 Advantageously, phone interviews also enabled us to interview GPs in other states or locations that were
geographically inaccessible or too costly to travel to for the researchers.

Overall, this study highlights the lack of knowledge about BD and uncertainty about how best to manage patients with high BD. Despite BD consumer campaigns in Australia and overseas, BD notification legislation in the USA, and the difference in public versus private screening services providing this information to women, GPs in Australia have limited experience in discussing BD and uncertainty about how best to manage women with dense breasts, especially if widespread notification is to be implemented in population-based screening. As GPs are likely be the main clinicians to have these discussions in Australia, women will depend on them moving forward in this complex and uncertain space. 30 31 Therefore, it is imperative that GPs are involved now in designing strategies and policies in relation to BD discussions and future screening protocols for women with dense breasts.

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**Acknowledgements** We thank the GPs who participated in this study.

**Contributors** BN, NH and KM conceived the study. BN, HD, SC, NH, MB, JH, AK and KM were involved in designing the study and developing the methods. BN and HD coordinated the running of the study and conducted the interviews. BN and HD analysed the data. BN drafted the manuscript. All authors contributed to the interpretation of the analysis, and critically revised and approved the manuscript.

**Funding** This study was funded by the Department of Health, Australian Government (grant number: N/A), JH is supported by a National Health and Medical Research Council (NHMRC) Early Career Fellowship (grant number: 1112509). NH is supported by the National Breast Cancer Foundation (NBCF) Chair in Breast Cancer Prevention (grant number: EC-21-001) and an NHMRC Investigator (Leader) grant (grant number: 1194410). KM is supported by NHMRC Principal Research Fellowship (grant number: 1121110) and NHMRC Program Grant (grant number: 1104136).

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** This study was approved by the University of Sydney Human Research Ethics Committee (Project No.: 2020/161).

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available on reasonable request. The data generated during the current study will be available from the corresponding author on reasonable request and in accordance with the consent from the participants and ethical approval from the University of Sydney.

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**References**

1 D’Orsi CJ SE, Mendelson EB, Morris EA. ACR BI-RADS® atlas, breast imaging reporting and data system. 5th ed. Reston, VA: American College of Radiology, 2013.
2 Boyd NF, Guo H, Martin LJ, et al. Mammographic density and the risk and detection of breast cancer. N Engl J Med 2007;356:227–36.
3 Sprague BL, Gangnon RE, Burt V, et al. Prevalence of mammographically dense breasts in the United States. J Natl Cancer Inst 2014;106. doi:10.1093/jnci/dju255. [Epub ahead of print: 12 09 2014].
4 Carney PA, Migliorelli DL, Yankaskas BC, et al. Individual and combined effects of age, breast density, and hormone replacement therapy use on the accuracy of screening mammography. Ann Intern Med 2003;138:188–95.
5 Houssami N, Hunter K. The epidemiology, radiology and biological characteristics of interval breast cancers in population mammography screening. NPJ Breast Cancer 2017;3:12.
6 Cappello NM. Mammographic ‘normal’ mammography reports—the happygram. J Am Coll Radiol 2013;10:905–8.
7 DenseBreast.info. Legislative information, 2019. Available: https://densebreastinfo.org/legislation.aspx
8 Houssami N, Lee CI. The impact of legislation mandating breast density notification – Review of the evidence. Breast 2018;42:102–12.
9 Nickel B, Farber R, Brennan M, et al. Breast density notification: evidence on whether benefit outweighs harm is required to inform future screening practice. BMJ Evid Based Med 2020. doi:10.1136/bmjebm-2020-111364. [Epub ahead of print: 14 Jul 2020].
10 Bakker MF, de Lange SV, Pijnappel RM, et al. Supplemental MRI screening for women with extremely dense breast tissue. N Engl J Med 2019;381:2091–102.
11 Longo DL. Detecting breast cancer in women with dense breasts. N Engl J Med 2019;381:2169–70.
12 Melnikow J, Fenton JJ, Whitchok EP, et al. Supplemental screening for breast cancer in women with dense breasts: a systematic review for the U.S. preventive services Task force. Ann Intern Med 2016;164:238–49.
13 Brown J, Soukas C, Lin JJ, et al. Physician knowledge, attitudes, and practices regarding breast density. J Womens Health 2019;28:1193–9.
14 Gunn CM, Kressin NR, Cooper K, et al. Primary care provider experience with breast density legislation in Massachusetts. J Womens Health 2018;27:615–22.
15 Khong KA, Hargreaves J, Aminololam-Shaker S, et al. Impact of the California breast density law on primary care physicians. J Am Coll Radiol 2015;12:256–60.
16 Maimone S, McDonough MD, Hines SL. Breast density reporting laws and supplemental Screening–A survey of referring providers’ experiences and understanding. Curr Probl Diagn Radiol 2017;46:105.
17 Casas RS, Ramachandran A, Gunn CM, et al. Explaining breast density recommendations: an introductory workshop for breast health providers. MedEdPORTAL 2017;13:10654.
18 BreastScreen Australia. Breast density and screening: position statement, 2020. Available: http://www.cancerscreening.gov.au/ internet/screening/publishing.nsf/Content/BD289E889FB58576CA25803E001FC4E6/$File/Accessible%20BreastScreen%20Australia%
BreastScreen WA. Dense breasts, 2019. Available: https://www.breastscreen.health.wa.gov.au/Breast-screening/Dense-breasts

Ritchie JSL, O’Connor W. Carrying out qualitative analysis. qualitative research practice: a guide for social science students and researchers. London: Sage, 2003: 219–62.

Gale NK, Heath G, Cameron E, et al. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Med Res Methodol 2013;13:1–8.

Allen & Clark Review of Evidence: Breast density and screening. A literature review to inform BreastScreen Australia's position statement on breast density and screening 2018.

Pickles K, Carter SM, Rychetnik L, et al. Primary goals, information-giving and men’s understanding: a qualitative study of Australian and UK doctors' varied communication about PSA screening. BMJ Open 2018;8:e018009.

Santiago-Rivas M, Benjamin S, Andrews JZ, et al. Breast density awareness and knowledge, and intentions for breast cancer screening in a diverse sample of women age eligible for mammography. J Cancer Educ 2019;34:90–7.

Tran ATN, Hwang JH, Choi E, et al. Impact of awareness of breast density on perceived risk, worry, and intentions for future breast cancer screening among Korean women. Cancer Res Treat 2021;53:55–64.

Slanetz PJ, Freer PE, Birdwell RL. Breast-density legislation-practical considerations. N Engl J Med 2015;372:593–5.

Leung J, Macleod C, McLaughlin D, et al. Screening mammography uptake within Australia and Scotland in rural and urban populations. Prev Med Rep 2015;2:559–62.

Stephens N. Collecting data from elites and ultra elites: telephone and face-to-face interviews with macroeconomists. Qualitative Research 2007;7:203–16.

Sturges JE, Hanrahan KJ, Telephone C. Comparing telephone and face-to-face qualitative interviewing: a research note. Qualitative Research 2004;4:107–18.

Klinger EV, Kaplan CP, St Hubert S, et al. Patient and provider perspectives on mammographic breast density notification legislation. MDM Policy Pract 2016;1:238146831668062.

Schifferdecker KE, Tosteson ANA, Kaplan C, et al. Knowledge and perception of breast density, screening mammography, and supplemental screening: in search of “informed”. J Gen Intern Med 2020;35:1654–60.