European Journal of Radiology 167 (2023) 111061

Contents lists available at ScienceDirect

European Journal of Radiology

journal homepage: www.elsevier.com/locate/ejrad

Norwegian radiologists' expectations of artificial intelligence in mammographic screening – A cross-sectional survey

Marit A. Martiniussen [a,b], Marthe Larsen [c], Anne Sofie F. Larsen [a], Tone Hovda [d], Henrik W. Koch [e,f], Atle Bjørnerud [g,h], Solveig Hofvind [c,i,*]

[a] Department of Radiology, Østfold Hospital Trust, Kalnes, Norway
[b] University of Oslo, Institute of Clinical Medicine, Oslo, Norway
[c] Section for Breast Cancer Screening, Cancer Registry of Norway, Oslo, Norway
[d] Department of Radiology, Vestre Viken Hospital Trust, Drammen, Norway
[e] Department of Radiology, Stavanger University Hospital, Stavanger, Norway
[f] Faculty of Health Sciences, University of Stavanger, Stavanger, Norway
[g] Computational Radiology & Artificial Intelligence (CRAI) Unit, Division of Radiology and Nuclear Medicine, Oslo University Hospital, Oslo, Norway
[h] Department of Physics, Faculty of Mathematics and Natural Sciences, University of Oslo, Oslo, Norway
[i] Department of Health and Care Sciences, UiT, The Artic University of Norway, Tromsø, Norway

A R T I C L E I N F O

Keywords:
Breast neoplasms
Mass screening
Mammography
Artificial intelligence
Survey
Questionnaires

A B S T R A C T

Purpose: To explore Norwegian breast radiologists' expectations of adding artificial intelligence (AI) in the interpretation procedure of screening mammograms.
Methods: All breast radiologists involved in interpretation of screening mammograms in BreastScreen Norway during 2021 and 2022 (n = 98) were invited to take part in this anonymous cross-sectional survey about use of AI in mammographic screening. The questionnaire included background information of the respondents, their expectations, considerations of biases, and ethical and social implications of implementing AI in screen reading. Data was collected digitally and analyzed using descriptive statistics.
Results: The response rate was 61% (60/98), and 67% (40/60) of the respondents were women. Sixty percent (36/60) reported ≥10 years' experience in screen reading, while 82% (49/60) reported no or limited experience with AI in health care. Eighty-two percent of the respondents were positive to explore AI in the interpretation procedure in mammographic screening. When used as decision support, 68% (41/60) expected AI to increase the radiologists' sensitivity for cancer detection. As potential challenges, 55% (33/60) reported lack of trust in the AI system and 45% (27/60) reported discrepancy between radiologists and AI systems as possible challenges. The risk of automation bias was considered high among 47% (28/60). Reduced time spent reading mammograms was rated as a potential benefit by 70% (42/60).
Conclusion: The radiologists reported positive expectations of AI in the interpretation procedure of screening mammograms. Efforts to minimize the risk of automation bias and increase trust in the AI systems are important before and during future implementation of the tool.

1. Introduction

Mammographic screening is recommended by international health organizations to detect breast cancer at an early stage and thereby reduce morbidity and mortality of the disease [1-3]. High quality screening and diagnostic performance at acceptable costs are prerequisites for success [4]. Recently, studies have shown promising results when exploring artificial intelligence (AI) in the interpretation procedure of screening mammograms, and different workflow strategies have been suggested; replacing radiologists, triaging, and decision support [5,6].

Implementing AI in a screening setting is a challenging task and the true effect is yet unknown due to lack of prospective studies. More knowledge about legal and ethical aspects, cost-effectiveness, communication, and information, as well as technical aspects and choice of strategy need to be addressed before an evidence-based conclusion

* Corresponding author at: Cancer Registry of Norway, P.O. Box 5313, 0304 Oslo, Norway.
E-mail address: sshh@kreftregisteret.no (S. Hofvind).

https://doi.org/10.1016/j.ejrad.2023.111061
Received 14 June 2023; Received in revised form 13 August 2023; Accepted 22 August 2023
Available online 23 August 2023
0720-048X/© 2023 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

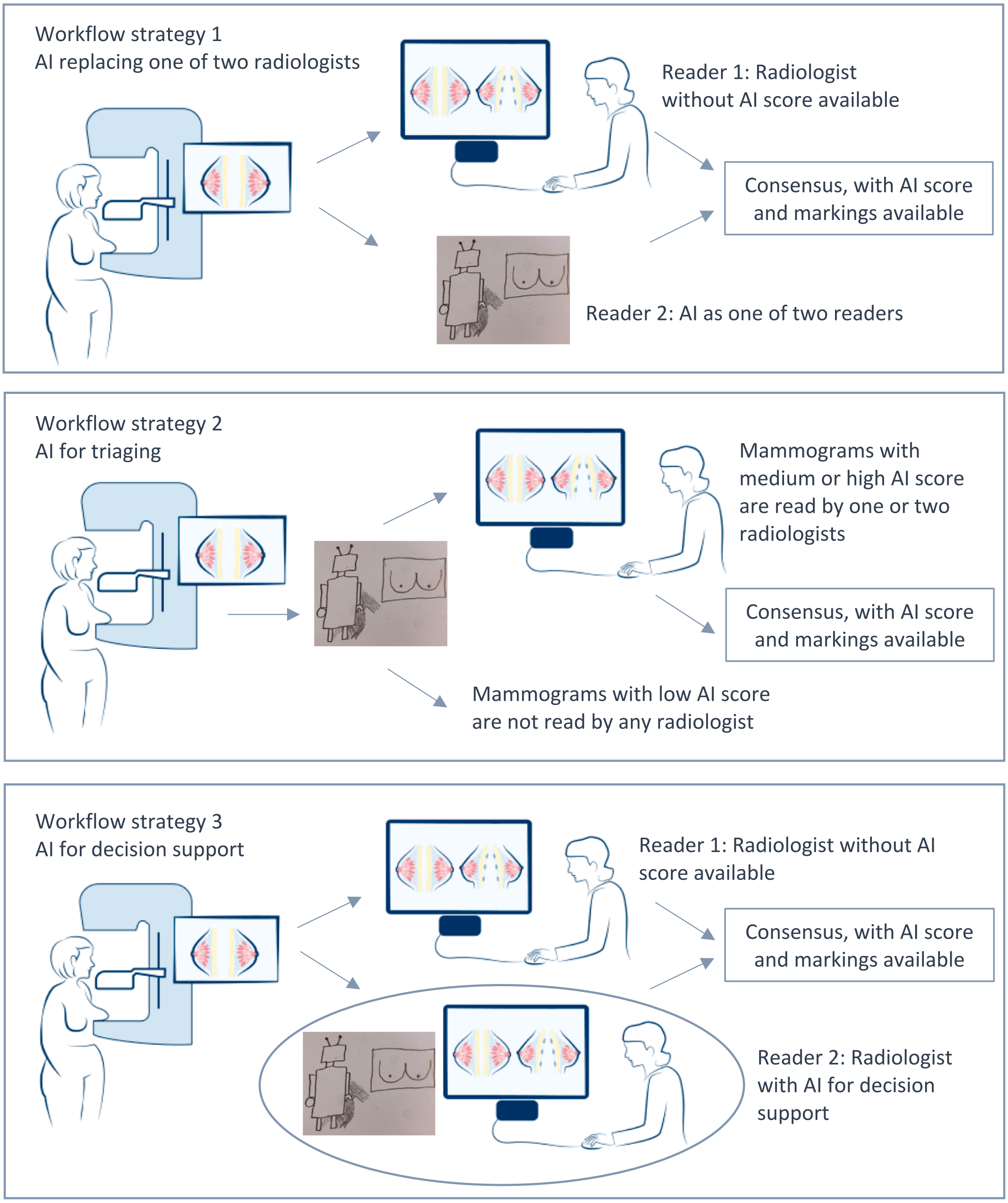

Fig. 1. Different workflow strategies presented in the survey. In workflow strategy 1, AI interpreted the screening mammograms and replaced one of two radiologists. In workflow strategy 2, AI was used for triaging screening mammograms into low and medium/high risk. Low risk mammograms were not interpreted by any radiologists, while medium/high risk mammograms were interpreted by one or two radiologists. In workflow strategy 3, AI was used for decision support. In all three strategies AI scores and markings were available at consensus.

about the benefits and harm can be drawn. Further, there are several questions related to acceptance of the use of AI by radiologists and by participants, in which their perspective is important to explore and understand [7-9].

A systematic review from 2022 including 19 studies, reported a positive attitude among radiologists towards use of AI in diagnostic imaging, but also concerns about ethical and legal implications in addition to a need of systematic education and training to achieve the full potential of the tool [10]. In a survey among mammography screen readers in the UK from 2022, the respondents supported introduction of AI as a partial replacement of human readers, but required further evidence and national guidelines prior to an implementation [11]. A study from 2023 concluded that Swedish breast radiologists were largely positive towards integrating AI in mammographic screening, but highlighted uncertainties related to risks and responsibilities [12].

With the aim of filling some of the knowledge gaps related to radiologists' perspectives on adding AI in the interpretation procedure of screening mammograms, we performed a cross-sectional survey among breast radiologist involved in BreastScreen Norway. We investigated the radiologists' expectations about how use of AI in different workflow strategies in the interpretation procedure might affect the screening outcome and workload. Further questions were related to their considerations on AI and bias, acceptable precision levels, and potential benefits and challenges of implementing AI in the interpretation procedure.

2. Material and methods

We designed an anonymous electronic questionnaire. All radiologists working at breast centers in Norway during 2021 and 2022 (n = 98) were invited to participate in the survey by an e-mail with a link to the electronic questionnaire, sent May 6, 2022. The radiologists' e-mail addresses were provided via the 17 breast centers in Norway [13]. The link was accessible until June 30, 2022. As there was no link between email addresses and responses, all radiologists received at least two reminders during the data collection period, independent of whether they had responded or not. Responses and data collections were handled digitally by nettskjema.no, a survey solution developed and hosted by the University of Oslo [14]. The survey solution ensured anonymity of the responder. Formal ethical approval was not required for the study, due to the design with fully anonymous responses [15]. The authors of this study did not participate in the survey.

BreastScreen Norway is administered by the Cancer Registry of Norway. The program started in 1996 and invites all women aged 50–69 to biennial two-view mammography. About 670 000 women are in the target group. Between 2017 and 2021, the average attendance rate was 76%, recall rate 3% and the rate of screen-detected cancer 0.64% [16]. Standard interpretation procedure is independent double reading with consensus. Both radiologists give each breast a score from 1 (negative) to 5 (highly suspicious of malignancy). If one or both radiologists have given a score of 2 or higher for one or both breasts, the case is discussed at consensus to decide whether to recall the woman for further assessment. Consensus includes two or more radiologists, who may be the same or different from those who performed the initial interpretation.

The questionnaire was developed by the authors, with support from radiologists working in the advisory group of BreastScreen Norway, and women in the target group of the screening program. The questions were based on descriptions and content in similar surveys [12,17-21]. We defined AI as computer programs trained to interpret mammograms based on deep learning. Sensitivity was defined as the probability of correctly identifying women with breast cancer, and specificity as the probability of correct interpretations of examinations as negative. We structured the questionnaire into four sections: i) background information, ii) expectations, iii) considerations of biases and iv) ethical and legal implications. Most questions were multiple choices with ordinal variables. A 5-point Likert scale was used when appropriate (Appendix Table A-D). To make the results more accessible to readers, the five points were collapsed into three; 1 + 2, 3, and 4 + 5. There were no open questions to ensure anonymity and to avoid challenges with categorization and standardization of responses and the introduction of bias.

Section i), background information, included demographic information, experience in screen-reading of mammograms, self-perceived knowledge, experience in AI, and attitudes towards future implementation of AI in the interpretation procedure in BreastScreen Norway. Age included five groups (<30, 31–40, 41–50, 51–60 and >60 years old) and years of experience four groups (<5, 5–10, 11–20 and >20 years). They were both collapsed into two; age <50 years and ≥50 years old, and experience of <10 years or ≥10 years, respectively. Experience in the use of AI in reading mammograms was collapsed to two groups; yes (tried it in research/received training/use it regularly) and no (not at all/seen it demonstrated).

In section ii), expectations of future implementation of AI in the interpretation procedure in BreastScreen Norway regarding the radiologists' sensitivity, specificity, and workload, was explored. Three different workflow strategies for the use of AI were visualized: AI replacing one of two radiologists, AI for triaging, and AI for decision support (Fig. 1). AI replacing one of two radiologists was not included in questions about AI's influence on radiologists' sensitivity and specificity, as radiologists would interpret the same selection of mammograms as today, and we considered this strategy not affecting radiologists' reading skills.

Section iii) addressed considerations of bias due to the AI system

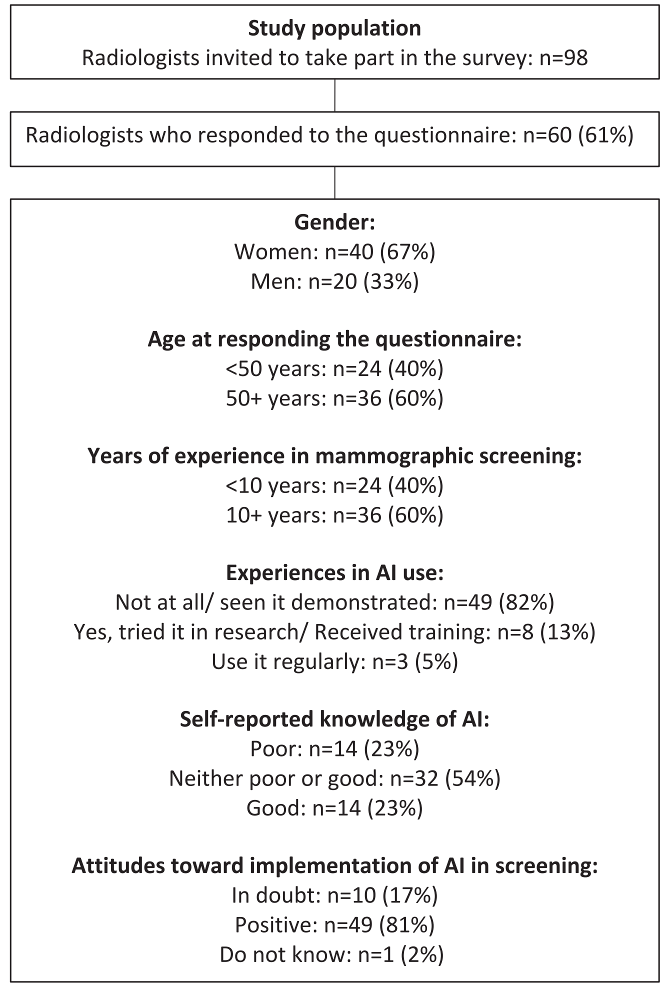

Fig. 2. Study population and background information.

itself and interaction between AI systems and the radiologists. We defined automation bias as the radiologists' overreliance on the AI systems' results [22].

The last section included acceptable levels of the AI systems' sensitivity and specificity, and potential challenges and benefits of implementing AI in the interpretation procedure. Levels of AI performance included worse or equivalent to an average performing radiologist, superior to an average performing radiologist and similar or superior to the best performing radiologists. We did not define "the best performing radiologists" further.

The radiologists could mark up to three options in a list of nine potential challenges and of seven potential benefits. Questions about acceptable performance of AI systems, potentially challenging and beneficial consequences were inspired by a study from Australia by Scheetz and Rothschild [17], while a Swedish study was basis for the questions about experience of AI and how AI would affect the radiologists' workload [12].

After the closing date for data collection, descriptive statistics were used to analyze the data. Categorical variables were reported as frequencies and percentages. Due to the sample size, we did not remove forms with missing values. Analyses were stratified by gender, years of experience (<10 years and ≥10 years) in screen reading of mammograms in BreastScreen Norway, age (<50 years and ≥50 years old) andexperience in the use of AI (yes and no). No power calculation was performed since all radiologists registered with interpretations in BreastScreen Norway during 2021–2022 were invited to participate in the survey. All statistical analyses were performed with Stata 17.0

Table 1
The respondents' consideration of acceptable level of performance by the AI systems related to sensitivity and specificity for three workflow strategies; AI as one of two readers, triaging and decision support.

	AI replacing one of two radiologists		Triaging		Decision support	
	Sensitivity	Specificity	Sensitivity	Specificity	Sensitivity	Specificity
Lower than or equivalent to an average performing radiologist (n, %)	16 (27%)	23 (38%)	12 (20%)	16 (27%)	15 (25%)	17 (28%)
Superior to an average performing radiologist (n, %)	15 (25%)	15 (25%)	14 (23%)	16 (27%)	13 (22%)	13 (22%)
Similar or superior to the best performing radiologists (n, %)	27 (45%)	21 (35%)	33 (55%)	25 (41%)	28 (46%)	26 (43%)
Do not know (n, %)	2 (3%)	1 (2%)	1 (2%)	2(3%)	4 (7%)	4 (7%)
Missing				1 (2%)		

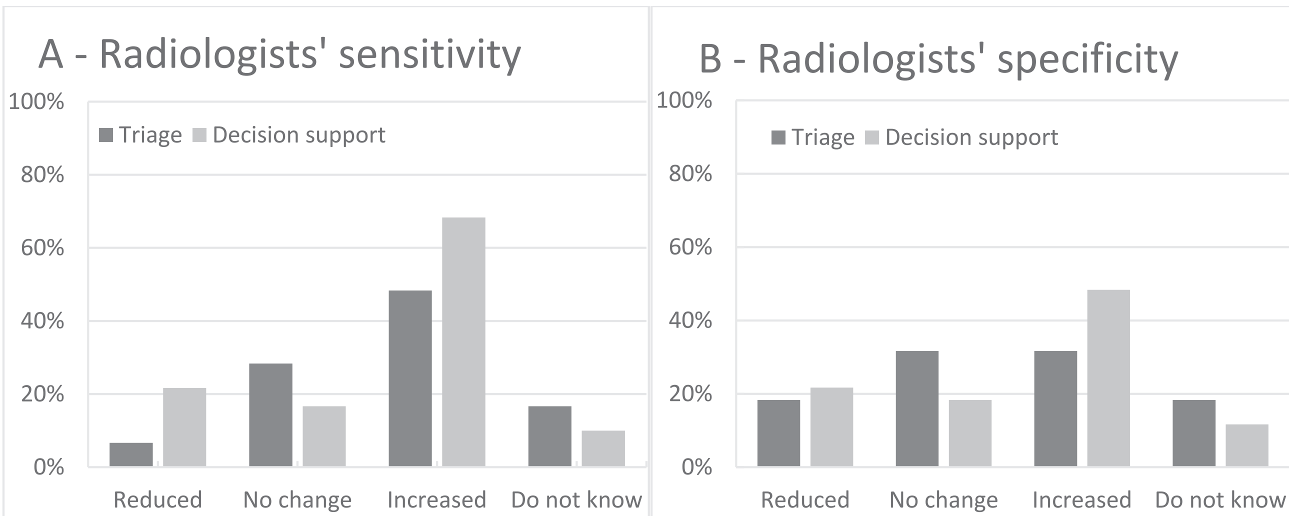

Fig. 3. The respondents' expectations of the influence AI may have on radiologists' sensitivity (A) and specificity (B) when used for two workflow strategies: for triaging and for decision support.

(StataCorp LLC, College Station, TX, USA).

3. Results

A total of 61% (60/98) of the invited radiologists responded to the questionnaire, 67% (40/60) were women and 60% (36/60) were 50 years or older (Fig. 2). Only one of the questionnaires had one missing answer (Table 1). We found 82% (49/60) of the respondents reporting no or limited experience in using AI in radiology, while 23% (14/60) reported good knowledge of AI in general. The majority, 82% (49/60), reported a positive attitude towards adding AI in the interpretation procedure of mammographic screening in the future. Background information stratified did not show any differences in the attitude by gender (Appendix Figure A).

3.1. Expectations

Expectations about how AI may affect radiologists' sensitivity and specificity were examined for AI as a triaging tool and as decision support (workflow strategy 2 and 3, Fig. 1). The response was given with standard interpretation procedure, independent double reading as the reference. If AI was used for triaging, 48% (29/60) expected an increase in sensitivity and 32% (19/60) expected an increase in specificity (Fig. 3A and Fig. 3B). The majority, 68% (41/60) of the respondents, expected increased sensitivity (Fig. 3A) and 48% (29/60) expected increased specificity (Fig. 3B) if AI was used for decision support.

When stratified by experience (<10 years and ≥10 years), a greater proportion of radiologists with ≥10 years of experience expected the workload related to consensus and recalls to increase, and a greater proportion of those with less experience expected the workload to be reduced (Fig. 4). If AI was used as one of two readers, 58% (21/36) of the most experienced radiologists expected the workload to increase; both at consensus and recall, while among the less experienced, 8% (2/24) expected the same (Figure 4 A1 and B1). If AI was used for triaging, the workload related to consensus was expected to decrease among 79% (19/24) of the less experienced, and among 50% (18/36) of the more experienced radiologists (Figure 4 A2). When stratified by age (<50 years old and ≥50 years old) we did not find such differences in the expectations about how AI may affect the workload (Appendix Table B). We did additional analysis stratified by experience in the use of AI (not at all/seen it demonstrated, n = 49 and tried it in research/received training/use it regularly, n = 11) and did not find statistically differences in any of the questions, with p-values ranging from 0.138 to 0.767 (data not shown in tables or figures).

3.2. Consideration of biases

We asked the radiologists to what extent they considered the risk of bias occurring in four known potential sources of bias, including bias within the AI system (Fig. 5A-C) and the interaction between the AI system and the radiologists (Fig. 5D). The most prominent finding for these four questions was the large proportion of "do not know"-responses on all questions, ranging from 20% to 37%. About half of the respondents, 47% (28/60), expected the radiologists to become over-reliant on the AI systems, i.e. risk of automation-bias.

3.3. Ethical and social implications

Most respondents considered that AI performance should be at a higher level than an average radiologist. A large proportion (35–55%) considered a level similar, or superior to the best performing radiologists as acceptable, for the three workflow strategies (Table 1). Their

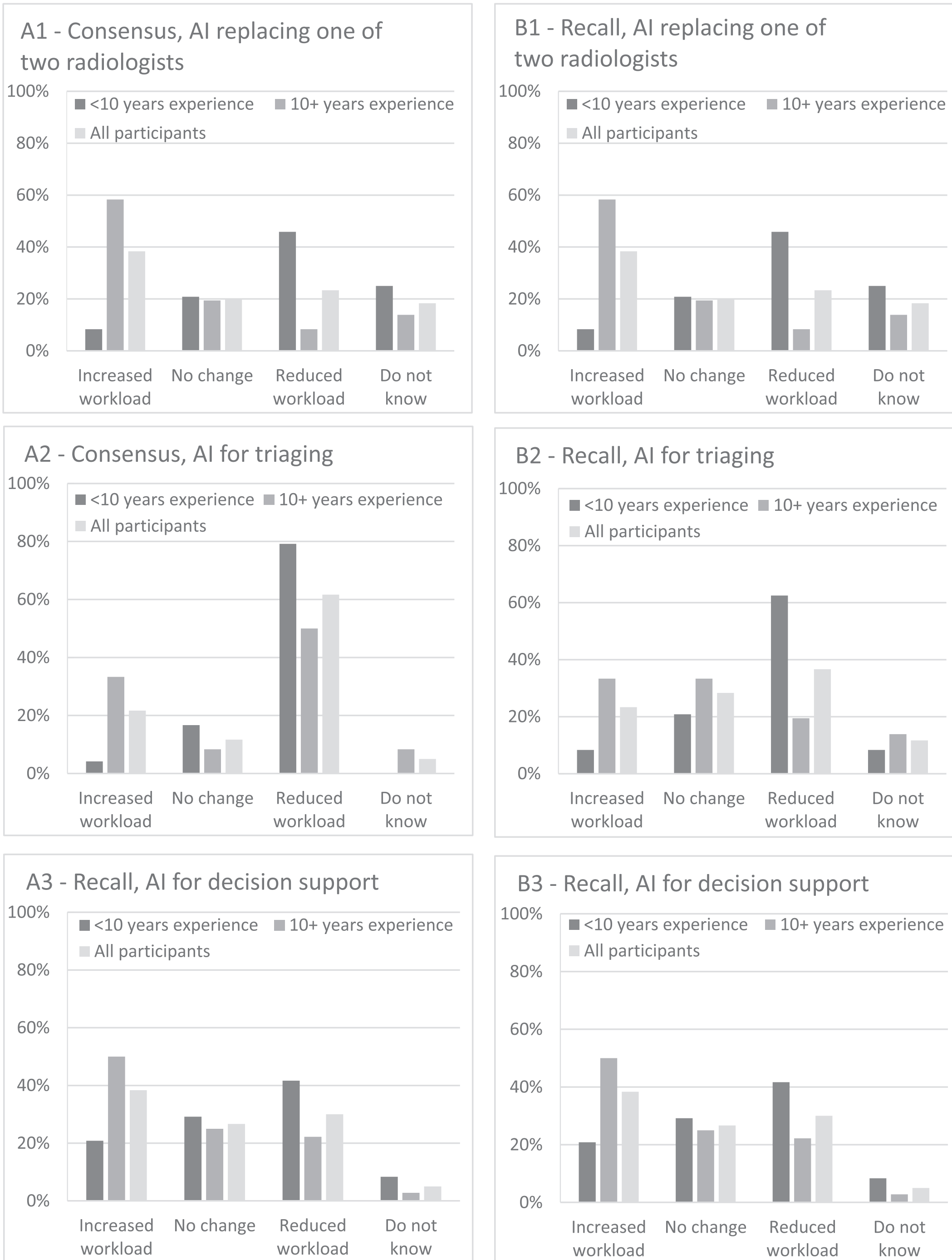

Fig. 4. The respondents' expectations of the influence AI may have on radiologists' workload related to consensus (A) and recall (B) for three workflow strategies: AI replacing one of two radiologists (1), AI for triaging (2) and AI for decision support (3), stratified by experience (<10 years and ≥10 years of experience in mammographic screening) and all respondents combined.

acceptance was stricter for sensitivity versus specificity.

The radiologists could mark up to three options of a list of potential challenges and potential benefits of introducing AI in the interpretation procedure of screening mammograms. We found 55% (33/60) of the respondents considered to trust the results of AI systems as a potential challenge (Fig. 6A). Discrepancy between the radiologists and AI systems was considered challenging among 45% (27/60), and 40% (23/60) rated the uncertainty about how AI might affect the quality of mammographic screening as challenging. Less time spent on screen-reading was considered a potential benefit for 70% (42/60) of the respondents, while reduced workload was considered beneficial for 55% (33/60) and reduced response time to the screened women for 48% (29/60) (Fig. 6B).

4. Discussion

This survey revealed positive expectations related to use of AI in the interpretation procedure of screening mammograms among Norwegian breast radiologists. They expected an increased sensitivity, and reduced time spent on screen reading. Almost half of the respondents considered the risk of automation bias to be high. Furthermore, they considered that AI performance should be at a higher level than an average radiologist

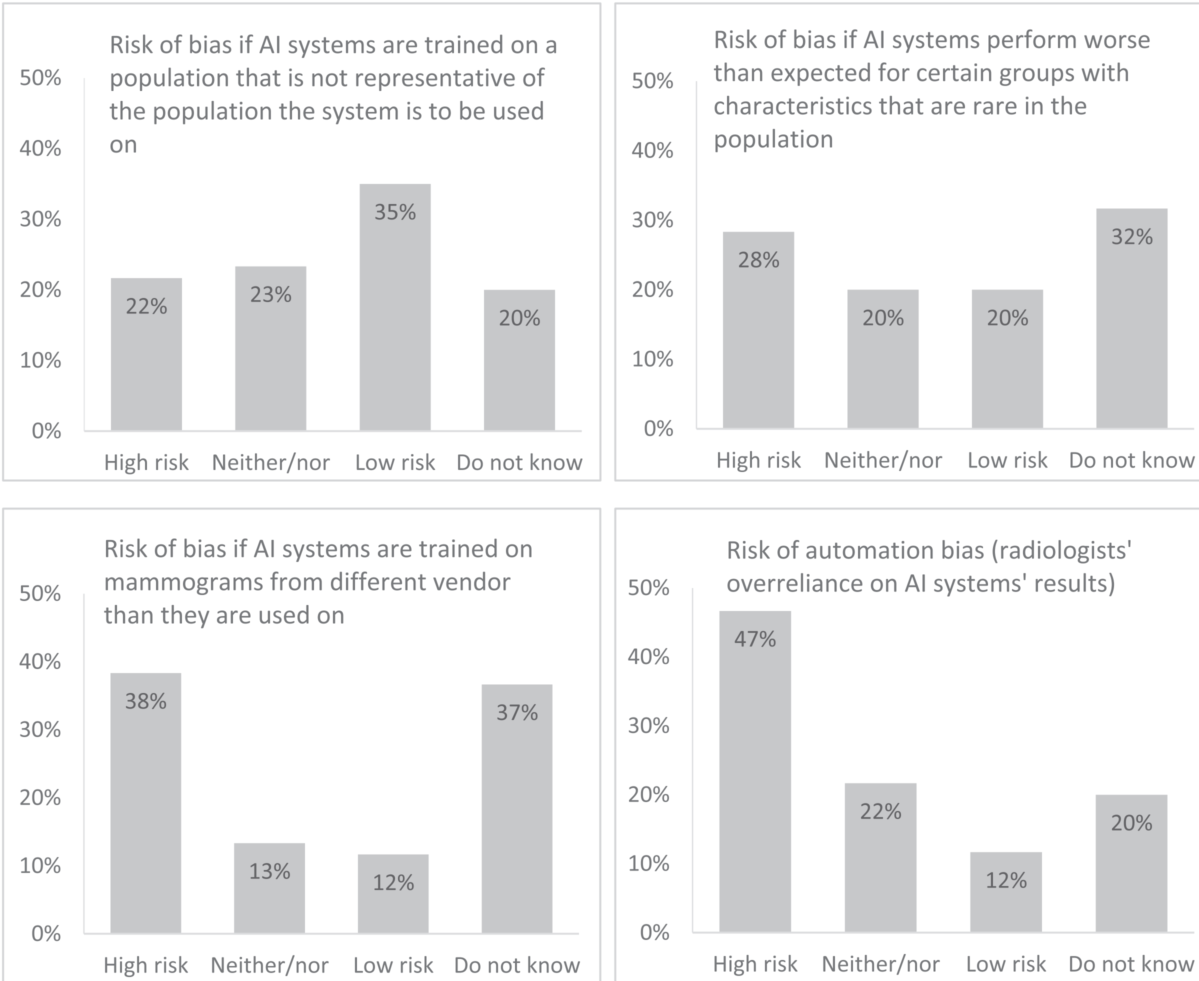

Fig. 5. The respondents' considerations of the risk of bias due to four possible sources.

and reported concerns about achieving trust in AI results and if discrepancy between the AI system and the radiologists' interpretations.

The positive attitude corresponded well to a study of mammography screen readers from the UK and a recently published Swedish study, where 63% and 80.8%, respectively, responded positively or strongly positively to the use of AI in screen reading [11,12]. The radiologists' positive attitude in our study was present despite lack of self-perceived knowledge and experience in using AI in screen reading. One explanation could be that many breast radiologists experience great work pressure with a feeling of being understaffed. Considering the promising results of using AI in the interpretation procedure, breast radiologists recognize the potential to improve efficiency and accuracy, which can lead to more time spent on clinical breast diagnostics and better patient outcomes. In addition, radiology has developed at a rapid pace in recent decades and radiologists are used to adapt new technological tools [23].

Our findings regarding expectations of increased sensitivity and reduced time spent interpreting screening mammograms by implementing AI in the interpretation procedure are consistent with a study among French radiologists, who reported expectation of reduced image-related medical errors and lowering interpreting time [21]. When stratified by years of experience in mammographic screening, we found a greater proportion of the less experienced radiologists having expectations of reduced workload regarding consensus and recall compared to the more experienced radiologists. We did not find the same differences when we stratified by age and experience in the use of AI in screen reading. However, the subgroups included a small number of radiologists.

Most of the respondents considered that AI should perform better than an average performing radiologist, which is consistent with the findings by Scheetz [17]. This is important knowledge for determining cutoff values when using AI for triaging and for choosing workflow strategies. AI systems performing with high accuracy are still not perfect, and transparency and knowledge about AI systems' strengths and weaknesses are important, both for radiologists' trust in systems and for informing the women in the target group.

Radiologists' trust in the AI systems was considered a potential challenge among most of the radiologists and support results of a survey from 2021, of German radiologists, IT specialists and industry representatives, reporting that only 25% of respondents would trust an AI result [18]. Trust in the AI systems is crucial for successful implementation, and lack of trust is considered one of the most important factors preventing faster adoption of AI within the healthcare system [24]. Trust and trustworthiness depend on many factors, including transparency and explainability. Exactly at what level the AI systems should be transparent and explainable is debatable. Too much information about the AI systems can make the systems more vulnerable to cyber-attacks, while too little information can make it difficult to find the cause of errors, and thus difficult to prevent the same error from occurring again [25]. A low degree of transparency and explainability is an inherent feature of deep learning, whereby the decision process appears as a 'black box' that is inaccessible to the human observer and refers to the AI systems making decisions that humans have trouble understanding. In addition, companies are often restrictive to share what they consider to be proprietary information [26].

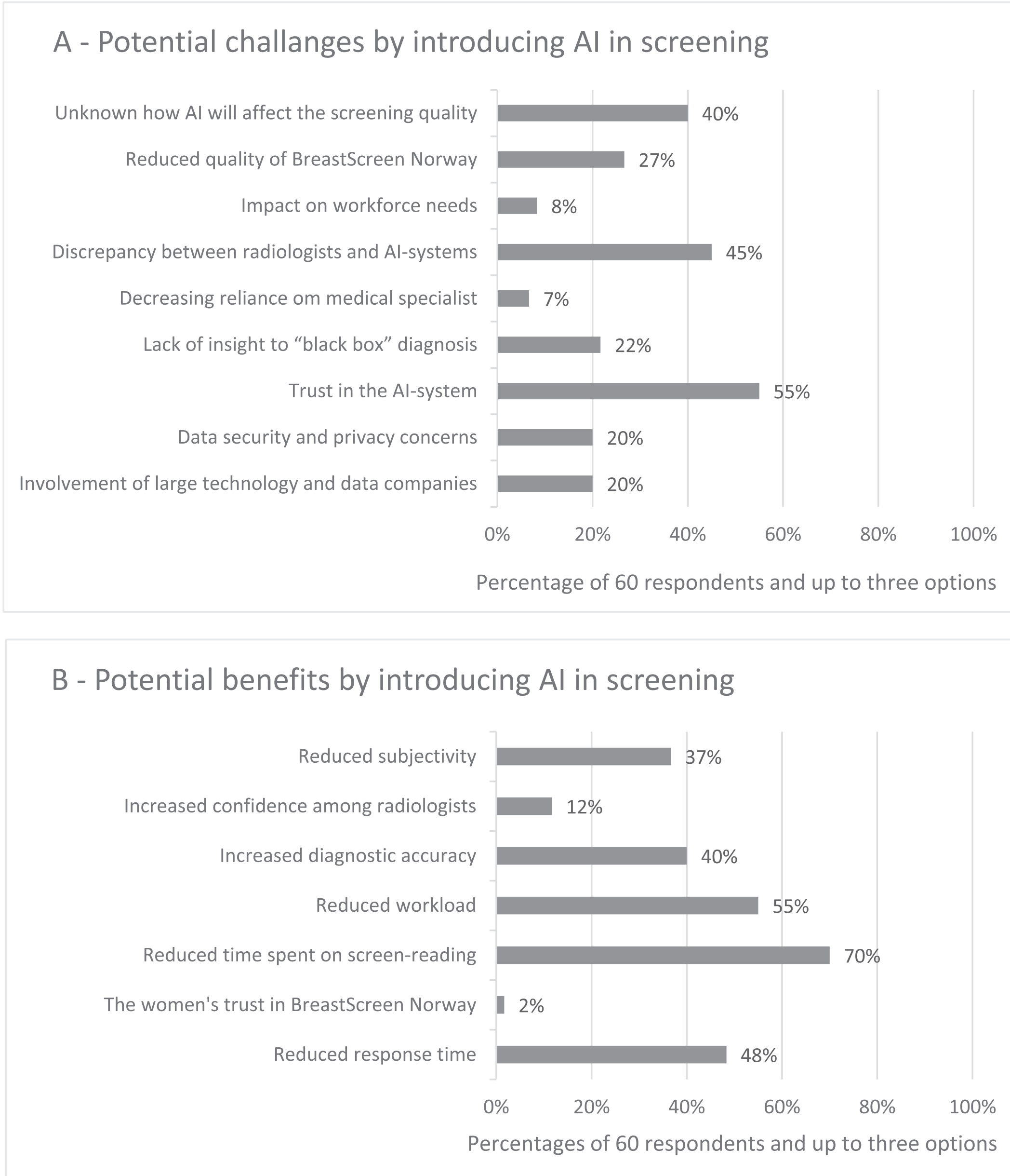

Fig. 6. Potential challenges (A) and benefits (B) when introducing AI in mammographic screening. Percentages of 60 respondents with up to three answers per respondent.

Several respondents considered discrepancies in the interpretation among radiologists and the AI systems as a potential challenge. As long as one reader is involved, the responsibility related to missed cases and lawsuits is expected to follow the same procedures as for standard mammographic screening interpretation. However, complete replacement of human readers by AI might represent a challenge. This might be an issue in the future and needs to be further investigated according to social, ethical, and legal aspects.

The risk of automation bias was considered high among about half of the radiologists. Such bias occur when the radiologists trust AI more than their own perception and interpretation; they miss cases they normally would have interpreted positive because of a low AI-score (omission error), or they interpret findings they normally would have considered negative as suspicious because the AI-score was high (commission error) [22]. The risk of automation bias may be higher for less experienced radiologists [27]. Inclusion of experienced breast radiologists in consensus might be a solution, to reduce the risk of automation bias.

A strength of this study is inclusion of the respondents’ opinions of different factors that might be important to consider in future prospective studies and implementations of AI in the interpretation procedure in mammographic screening. Only a few studies have investigated breast radiologists’ perceptions of AI in the interpretation procedure of screening mammograms. Our results supported previous findings for overlapping items and added ethical aspects about trust in AI results and acceptable level of precision for an AI system, legal items as discrepancies between radiologists and AI, as well as what expectations the radiologists have for screening outcomes and workload for different workflow strategies. We invited all active readers in a nationwide screening program, and the response rate was 61%, which we considered acceptable [28]. However, the respondents may have different views than the non-respondents, and we can assume a certain degree of selection bias with a more positive attitude towards AI among the respondents. Our study included radiologist from only one country and may have limited generalizability to other countries due to differences in organization of the screening programs. However, our results corresponded well with other surveys.

5. Conclusion

Norwegian breast radiologists revealed positive expectations regarding sensitivity and reduced time spent on screen-reading of mammograms. Many respondents reported the risk of automation bias to be high and the majority deemed acceptable performance of AI systems to be at a higher level than an average radiologist. Lack of trust in AI results and discrepancies between AI systems and radiologists were reported as the main potential challenges. Efforts to ensure and maintain the radiologists' trust in AI systems, to minimize the risk of automation bias and clear legal frameworks seems to be important running prospective studies, and when implementing the technology to reach its beneficial potential for the women, the radiologists, and the society.

Funding

This work was supported by Sout-Eastern Norway Regional Health Authority and Østfold Hospital Trust.

CRediT authorship contribution statement

Marit A. Martiniussen: Conceptualization, Funding acquisition, Formal analyses, Methodology, Writing - original draft, Writing - review & editing. **Marthe Larsen:** Supervision, Writing - review & editing. **Anne Sofie F. Larsen:** Conceptualization, Methodology, Writing - review & editing. **Tone Hovda:** Writing - review & editing. **Henrik W. Koch:** Writing - review & editing. **Atle Bjørnerud:** Writing - review & editing. **Solveig Hofvind:** Project administration, Methodology, Conceptualization, Funding acquisition, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ejrad.2023.111061.

References

[1] European Commission Initiative on Breast Cancer, Screening for women aged 50-69, 2023. https://healthcare-quality.jrc.ec.europa.eu/european-breast-cancer-guidelines/screening-ages-and-frequencies/women-50-69 (accessed June 8 2023).
[2] National Cancer Institute, Breast Cancer Screening (PDQ®)–Health Professional Version, 2022. https://www.cancer.gov/types/breast/hp/breast-screening-pdq#_74 (aaccessed June 8 2023).
[3] S.W. Duffy, L. Tabar, A.M. Yen, P.B. Dean, R.A. Smith, H. Jonsson, S. Tornberg, S. L. Chen, S.Y. Chiu, J.C. Fann, M.M. Ku, W.Y. Wu, C.Y. Hsu, Y.C. Chen, G. Svane, E. Azavedo, H. Grundstrom, P. Sunden, K. Leifland, E. Frodis, J. Ramos, B. Epstein, A. Akerlund, A. Sundbom, P. Bordas, H. Wallin, L. Starck, A. Bjorkgren, S. Carlson, I. Fredriksson, J. Ahlgren, D. Ohman, L. Holmberg, T.H. Chen, Mammography screening reduces rates of advanced and fatal breast cancers: Results in 549,091 women, Cancer 126 (13) (2020) 2971–2979.
[4] J.T. Loud, J. Murphy, Cancer screening and early detection in the 21st century, Semin. Oncol. Nurs. 33 (2) (2017) 121–128.
[5] M. Larsen, C.F. Aglen, C.I. Lee, S.R. Hoff, H. Lund-Hanssen, K. Lang, J.F. Nygard, G. Ursin, S. Hofvind, Artificial Intelligence Evaluation of 122 969 Mammography Examinations from a Population-based Screening Program, Radiology 303 (3) (2022) 502–511.
[6] W.C. Ou, D. Polat, B.E. Dogan, Deep learning in breast radiology: current progress and future directions, Eur. Radiol. 31 (7) (2021) 4872–4885.
[7] R.W. Filice, R.M. Ratwani, The Case for User-Centered Artificial Intelligence in Radiology, Radiol Artif Intell 2(3) (2020) e190095.
[8] H. Chen, C. Gomez, C.M. Huang, M. Unberath, Explainable medical imaging AI needs human-centered design: guidelines and evidence from a systematic review, NPJ Digit Med. (2022) 156.
[9] H.P. Chan, R.K. Samala, L.M. Hadjiiski, CAD and AI for breast cancer-recent development and challenges, Br. J. Radiol. 93 (1108) (2020) 20190580.
[10] S.M. Santomartino, P.H. Yi, Systematic Review of Radiologist and Medical Student Attitudes on the Role and Impact of AI in Radiology, Acad. Radiol. 29 (11) (2022) 1748–1756.
[11] C.F. de Vries, S.J. Colosimo, M. Boyle, G. Lip, L.A. Anderson, R.T. Staff, C.R.C. i, AI in breast screening mammography: breast screening readers' perspectives, Insights Imaging 13(1) (2022) 186.
[12] C. Högberg, S. Larsson, K. Lång, Anticipating artificial intelligence in mammography screening: views of Swedish breast radiologists, BMJ Health Care Inform. 30 (1) (2023) e100712.
[13] Brystsentre, 2023. https://www.kreftregisteret.no/screening/mammografiprogrammet/Brystdiagnostiske-sentre/. (Accessed June 8 2023).
[14] Nettskjema. https://nettskjema.no/. (Accessed June 9 2023).
[15] Forms set up with anonymous submissions, 2018. https://www.uio.no/english/services/it/adm-services/nettskjema/help/answering/not-storing-person-info.html. (Accessed June 8 2023).
[16] E. Bjørnson, Å. Holen, S. Sagstad, M. Larsen, J. Thy, G. Mangerud, A. Ertzaas, S. Hofvind, BreastScreen Norway: 25 years of organized screening, Oslo, Cancer Registry of Norway (2022).
[17] J. Scheetz, P. Rothschild, M. McGuinness, X. Hadoux, H.P. Soyer, M. Janda, J.J. J. Condon, L. Oakden-Rayner, L.J. Palmer, S. Keel, P. van Wijngaarden, A survey of clinicians on the use of artificial intelligence in ophthalmology, dermatology, radiology and radiation oncology, Sci. Rep. 11 (1) (2021) 5193.
[18] F. Jungmann, T. Jorg, F. Hahn, D. Pinto Dos Santos, S.M. Jungmann, C. Duber, P. Mildenberger, R. Kloeckner, Attitudes Toward Artificial Intelligence Among Radiologists, IT Specialists, and Industry, Acad. Radiol. 28 (6) (2021) 834–840.
[19] I.A. Scott, S.M. Carter, E. Coiera, Exploring stakeholder attitudes towards AI in clinical practice, BMJ Health Care Inform. 28 (1) (2021) e100450.
[20] A.R. Artino, Jr., J.S. La Rochelle, K.J. Dezee, H. Gehlbach, Developing questionnaires for educational research: AMEE Guide No. 87, Med Teach 36(6) (2014) 463-74.
[21] Q. Waymel, S. Badr, X. Demondion, A. Cotten, T. Jacques, Impact of the rise of artificial intelligence in radiology: What do radiologists think? Diagn. Interv. Imaging 100 (6) (2019) 327–336.
[22] D. Lyell, E. Coiera, Automation bias and verification complexity: a systematic review, J. Am. Med. Inform. Assoc. 24 (2) (2017) 423–431.
[23] A.P. Brady, R.G. Beets-Tan, B. Brkljačić, C. Catalano, A. Rockall, M. Fuchsjäger, The role of radiologist in the changing world of healthcare: a White Paper of the European Society of Radiology (ESR), Insights Imaging 13 (1) (2022).
[24] E. Commission, C. Directorate-General for Communications Networks, Technology, Study on eHealth, interoperability of health data and artificial intelligence for health and care in the European Union : final study report. Lot 2, Artificial Intelligence for health and care in the EU, Publications Office of the European Union, 2022.
[25] J.R. Geis, A.P. Brady, C.C. Wu, J. Spencer, E. Ranschaert, J.L. Jaremko, S.G. Langer, A. Borondy Kitts, J. Birch, W.F. Shields, R. van den Hoven van Genderen, E. Kotter, J. Wawira Gichoya, T.S. Cook, M.B. Morgan, A. Tang, N.M. Safdar, M. Kohli, Ethics of Artificial Intelligence in Radiology: Summary of the Joint European and North American Multisociety Statement, Radiology 293(2) (2019) 436-440.
[26] K. Lekadir, G. Quaglio, A.T. Garmendia, C. Gallin, Artificial intelligence in healthcare applications, risks, and ethical and societal impacts, EPRS (European Parliamentary Research Service), 2022.
[27] T. Dratsch, X. Chen, M. Rezazade Mehrizi, R. Kloeckner, A. Mähringer-Kunz, M. Püsken, B. Baeßler, S. Sauer, D. Maintz, D. Pinto dos Santos, Automation Bias in Mammography: The Impact of Artificial Intelligence BI-RADS Suggestions on Reader Performance, Radiology 307 (4) (2023).
[28] J.E. Fincham, Response rates and responsiveness for surveys, standards, and the Journal, Am. J. Pharm. Educ. 72 (2) (2008) 43.