



ELSEVIER



CrossMark

Canadian Association of Radiologists Journal 69 (2018) 169–175

CANADIAN
ASSOCIATION OF
RADIOLOGISTS
JOURNAL

www.carjonline.org

Thoracic and Cardiac Imaging / Imagerie cardiaque et imagerie thoracique

Mammography Clinical Image Quality and the False Positive Rate in a Canadian Breast Cancer Screening Program

Marie-Hélène Guertin, PhD^{a,*}, Isabelle Théberge, PhD^{a,b},
Hervé Tchala Vignon Zomahoun, PhD^c, Michel-Pierre Dufresne, MD^d, Éric Pelletier, MSc^a,
Jacques Brisson, MD, DSc^{a,b,c}

^aBureau d'information et d'études en santé des populations, Institut national de santé publique du Québec, Québec City, Québec, Canada

^bDépartement de médecine sociale et préventive, Faculté de médecine, Université Laval, Québec City, Québec, Canada

^cAxe Oncologie, Centre de recherche du CHU de Québec, Québec City, Québec, Canada

^dDépartement de Radiologie, Hôpital Maisonneuve-Rosemont, Montréal, Québec, Canada

Abstract

Purpose: The study sought to determine if mammography quality is associated with the false positive (FP) rate in the Quebec breast cancer screening program in 2004 and 2005.

Methods: Mammography quality of a random sample of screen-film mammograms was evaluated by an expert radiologist following the criteria of the Canadian Association of Radiologists. For each screening examination, scores ranging from 1 (poor quality) to 5 (excellent quality) were attributed for positioning, compression, contrast, exposure level, sharpness, and artifacts. A final overall quality score (lower or higher) was also given. Poisson regression models with robust estimation of variance and adjusted for potential confounding factors were used to assess associations of mammography quality with the FP rate.

Results: Among 1,209 women without cancer, there were 104 (8.6%) FPs. Lower overall mammography quality is associated with an increase in the FP rate (risk ratio [RR], 1.4; 95% confidence interval [CI], 1.0-2.1; $P = .07$) but this increase was not statistically significant. Artifacts were associated with an increase in the FP rate (RR, 2.1; 95% CI, 1.3-3.3; $P = .01$) whereas lower quality of exposure level was related to a reduction of the FP rate (RR, 0.4; 95% CI, 0.1-1.0; $P = .01$). Lower quality scores for all other quality attributes were related to a nonstatistically significant increase in the FP rate of 10%-30%.

Conclusions: Artifacts can have a substantial effect on the FP rate. The effect of overall mammography quality on the FP rate may also be substantial and needs to be clarified.

Résumé

Objet : Cette étude vise à déterminer si la qualité des mammographies a influé sur le taux de « faux positifs » du Programme québécois de dépistage du cancer du sein en 2004 et 2005.

Méthodes : La qualité d'un échantillon aléatoire de clichés mammaires écran-film a été évaluée par un radiologiste chevronné en fonction des critères de l'Association canadienne des radiologistes. Pour chaque examen de dépistage, des notes allant de 1 (mauvaise qualité) à 5 (excellente qualité) ont été attribuées au positionnement, à la compression, au contraste, à l'exposition, à la netteté et aux artefacts. Une note visant la qualité d'ensemble (faible ou élevée) a également été attribuée. Des modèles de régression de Poisson avec variance robuste, ajustés en fonction de potentiels facteurs confondants, ont été utilisés pour évaluer les associations entre la qualité des mammographies et le taux de « faux positifs ».

Résultats : Parmi les 1 209 femmes qui ne présentaient pas de cancer, 104 faux positifs (8,6 %) ont été dénombrés. Une faible qualité des mammographies est associée à une hausse du taux de faux positifs (ratio de risque [RR] de 1,4; intervalle de confiance [IC] de 95 %, 1,0-2,1; $P = 0,07$), mais ce résultat n'est pas significatif sur le plan statistique. Les artefacts sont associés à une hausse du taux de faux positifs (RR de 2,1; IC de 95 %, 1,3-3,3; $P = 0,01$), tandis que la faible qualité de l'exposition est associée à une réduction du taux de faux positifs (RR de 0,4; IC de 95 %, 0,1-1,0; $P = 0,01$). Pour tous les autres critères de qualité, les notes faibles sont associées à une hausse non significative sur le plan statistique du taux de faux positifs de l'ordre de 10 % à 30 %.

* Address for correspondence: Marie-Hélène Guertin, PhD, Institut national de santé publique du Québec, 945 Avenue Wolfe, Québec City, Québec G1V 5B3, Canada.

E-mail address: marie-helene.guertin.1@ulaval.ca (M. -H. Guertin).

Conclusions : La présence d'artefacts peut avoir un effet substantiel sur le taux de faux positifs. L'effet de la qualité globale de la mammographie sur le taux de faux positifs pourrait également être important et doit être étudié de plus près.

© 2017 Canadian Association of Radiologists. All rights reserved.

Key Words: mammography; screening; breast cancer; false positive; quality

Mammography is currently the preferred test in breast cancer screening programs. High mammography quality allows a clear visualisation of all breast tissue and is hypothesized to increase the ability of radiologists to detect cancers while decreasing the risk of equivocal examinations leading to false positives [1–4].

Despite the expected benefits of mammography quality, few studies have examined the relationship between clinical image quality in daily practice and mammography outcomes such as sensitivity and false positive rate [5]. Some studies have analysed how mammography quality could hinder cancer detection [2,6–11]. One study has concluded that lower image quality was associated with later stage at diagnosis [6] and, another, that lower mammography quality (especially lower quality of positioning) was associated with lower screening sensitivity [2]. Study designs varied substantially but at least 4 studies suggest that mammography quality could contribute to a non-negligible proportion of breast cancers missed at mammography [2,6,7,10].

Mammography quality could also affect the false positive rate. False positives are a frequent disadvantage of screening. They induce anxiety for recalled women as well as additional imaging, radiation and costs [12–14]. To our knowledge, no study has evaluated the impact of clinical image quality on the false positive rate.

Many measures are implemented in the Programme Québécois de Dépistage du cancer du sein (PQDCS) (Quebec Breast Cancer Screening Program) [15,16] to ensure high mammography quality. Participating facilities must, among other requirements, be accredited by the Canadian Association of Radiologists (CAR). The facility personnel must have specific qualifications, and both technical and clinical image quality are evaluated every 3 years. Facilities must also be certified by the Laboratoire de Santé Publique du Québec. This certification includes yearly visits by a physicist who verifies that the mammography unit and the equipment used for image processing and viewing conditions are adequate. The physicists also verify that the participating facilities follow the strict quality-control protocols specified by the program [17].

Despite these efforts, mammography quality in daily practice still appears to vary substantially [16]. Thus, the main objective of the study was to evaluate the impact of clinical image quality on the false positive rate. The association of mammography quality attributes, which include positioning, compression, sharpness, contrast, exposure level, and artifacts, with the false positive rate was also assessed separately.

Methods

Population and Sample

All women living in Quebec and 50-69 years of age without a history of breast cancer are invited to mammography screening biennially within the PQDCS. The study sample was drawn from screening examinations performed in the program over the period 2004-2005.

The sample selection has already been described elsewhere [16]. Briefly, a total of 426,408 screen-film screening examinations were identified in PQDCS information system over the study period. Of these screening examinations, 32,218 were excluded and the sample was drawn from the 394,190 eligible screening examinations using a 2-stage cluster sample technique (Figure 1). The final sample included 1278 mammograms, of which 58 (4.5%) could not be retrieved, leaving 1220 mammograms to be evaluated for clinical image quality. Of the 1220 women, 1209 had no breast cancer diagnosis within 2 years of their screening.

All women who participate to the PQDCS sign an informed consent allowing their data to be used for program evaluation. The ethics committee of the Centre hospitalier affilié de Québec approved the project.

Mammography Clinical Quality

Quality of mammograms was assessed using the CAR criteria which are the same as those of the American Association of Radiologists [18,19]. The following quality attributes were evaluated: positioning, compression, exposure level, contrast, sharpness, noise, and artifacts. Labels were masked to maintain confidentiality and the quality of labeling was therefore not evaluated. Screening examinations include 1 craniocaudal view and 1 mediolateral view for each breast. Quality evaluations were attributed to the whole screening examination and not to individual projections. Quality attributes were scored from 1 (very poor quality) to 5 (very high quality). A final overall quality evaluation (higher or lower) was also given. A score of 1 or 2 for any attribute was sufficient for the mammogram to be considered of lower overall quality. The whole sample was evaluated by an experienced radiologist who has evaluated the quality of mammograms for the CAR Mammography Accreditation Program. The reviewer was blinded to the recall status of the mammogram.

Download English Version:

<https://daneshyari.com/en/article/8821174>

Download Persian Version:

<https://daneshyari.com/article/8821174>

[Daneshyari.com](https://daneshyari.com)