USE OF ARTIFICIAL INTELLIGENCE MAY ENHANCE EARLY DETECTION OF BREAST CANCER IN SCREENING PROGRAMS

(1) University of St.Gallen, School of Medicine, Chair of Health Economics, Policy and Management, St.Gallen, Switzerland, (2) Krebsliga Ostschweiz, St.Gallen, Switzerland

Marcel Blum [(1,2)*], Rudolf Morant [(2)], Alexander Geissler [(1)], David Ehlig [(1)]

*** Marcel.Blum@krebsliga-ostschweiz.ch**

AIM & OBJECTIVES

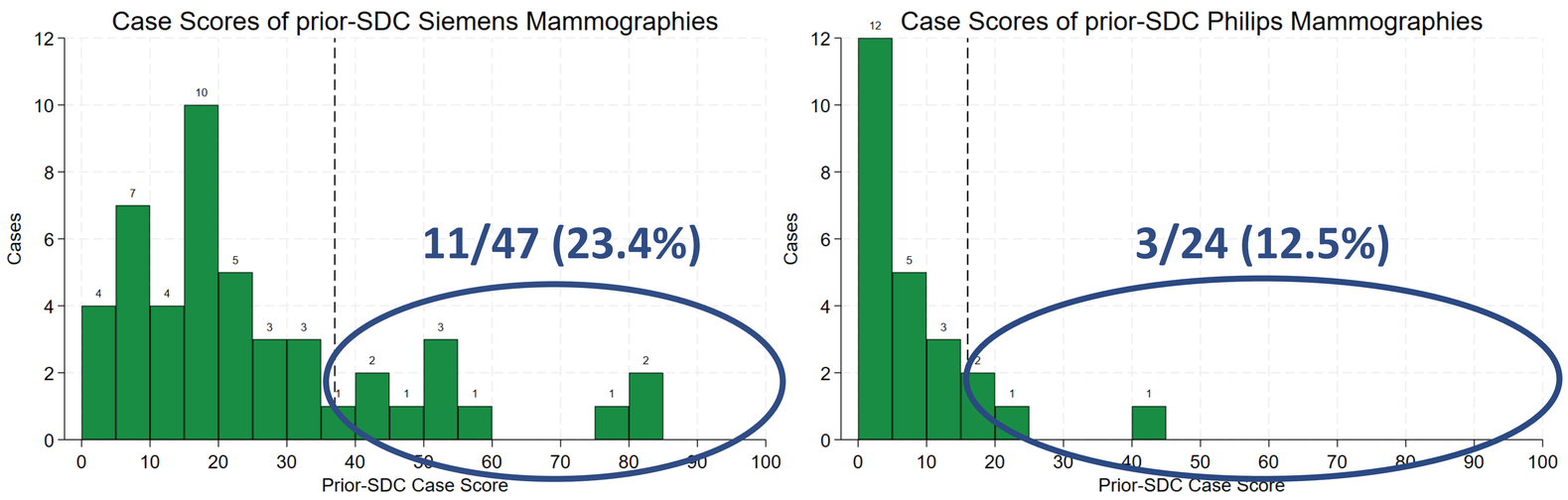
- Artificial intelligence (AI) may detect breast cancer (BC) earlier by marking lesions on a mammography potentially invisible to the human eye[1].
- This might allow some screen-detected cancer (SDC) cases to be diagnosed at an earlier screening round[2].
- AI scores might also help to personalize the screening interval, which could further enhance early BC diagnosis[3,4].
- We evaluated whether an AI algorithm assigned suspicious scores to prior-SDC mammographies that could have enabled earlier BC detection.

PATIENTS & METHODS

- We retrospectively analyzed 28,016 mammographies of women who participated in the screening program "donna" in 2022 and 2023. Prior-SDC mammographies in 2019-2021 were added to the analysis if available.
- Mammographies were retrospectively analyzed by Profound AI®, which assigned each mammography a case score and a predictive risk score:
  - Case Score = reflects the certainty (0-100) of the AI that the mammography contains a cancer case
  - Risk Score = AI assessed probability that the woman develops a cancer case within the screening interval of two years
- 71 prior-SDC mammographies, acquired on Siemens Inspiration and Philips L50 devices, with AI scores available were included in the analysis.
- Mammographies were flagged by the AI as suspicious if the case score was greater than or equal to the optimal device-specific threshold, based on sensitivity and specificity. Device-specific thresholds were used as AI assigned case scores differed significantly among mammography devices[5].
- Mammographies were seen as suspicious if the predictive risk score was in the moderate or high-risk category.

RESULTS

- The screening interval between the prior-SDC and SDC mammographies was on average 29.1 (± 4.6) months.
- A total of 14 out of 71 mammographies (19.7%) had a case score greater than or equal to the corresponding device-specific thresholds of 37 (Siemens) and 16 (Philips). Mammographies acquired on Siemens were flagged more often (11/47, 23.4%) than those acquired on Philips devices (3/24, 12.5%).



- 12 out of these 14 AI-flagged prior-SDCs (85.7%) were initially not discussed in a consensus conference, and none of the 14 women underwent further investigations.
- AI-flagged prior-SDC mammographies led to SDCs that were significantly more often lymph-node positive, i.e., ≥ N1 (35.7% vs 3.5%, p<0.001), and tendentially larger (20.3mm vs 18.0mm, p=0.6) than SDCs whose prior-SDC mammographies were not AI-flagged.
- Combining AI case and risk scores could have enhanced earlier detection of half of the BC cases, either at the prior-SDC mammography (high case score) or with a shortened screening interval (high risk score).

		Case Score (threshold according to device)	
		Low	High
Risk Score	Low	**35**	**1**
	High	**21**	**13**

Risk score not available for one mammography

High case score of prior-SDC: Potentially missed cancer

High risk score of prior-SDC: Earlier subsequent mammography may have been beneficial

CONCLUSIONS & DISCUSSION

- Using AI case scores may enhance early BC detection by reducing potentially missed cancers later diagnosed as interval BC or as SDC in the next regular screening round[2,3].
- AI-flagged prior-SDC mammographies led to SDCs that were clinically relevant[6].
- Using AI scores supports a personalized screening, such as risk-stratified screening intervals[4].
- However, further research on AI implementation in screening programs should also consider human–AI interactions as well as genetic risk factors.

REFERENCES

1. Yu, T. T., Hoyt, A. C., Joines, M. M., Fischer, C. P., Yaghmai, N., Chalfant, J. S., ... & Milch, H. S. (2025). Mammographic classification of interval breast cancers and artificial intelligence performance. JNCI: Journal of the National Cancer Institute, djaf103.
2. Gjesvik, J., Moshina, N., Lee, C. I., Miglioretti, D. L., & Hofvind, S. (2024). Artificial intelligence algorithm for subclinical breast cancer detection. JAMA Network Open, 7(10), e2437402-e2437402.
3. Subelack, J., Morant, R., Blum, M., Gräwingholt, A., Vogel, J., Geissler, A., & Ehlig, D. (2025). Retrospective evaluation of interval breast cancer screening mammograms by radiologists and AI. European Radiology, 1-13.
4. Hill H, Roadevin C, Duffy S, Mandrik O, Brentnall A. Cost-Effectiveness of AI for Risk-Stratified Breast Cancer Screening. JAMA Netw Open. 2024;7(9):e2431715.
5. Blum M, Morant R, Eichenberger A, Geissler A, Subelack J, Vogel J, Ehlig D. (forthcoming). AI Performance Varies considerably across Mammography Devices: A Multi-Site and Multi-Vendor Retrospective Study from a Swiss Screening Program
6. Hernström, V., Josefsson, V., Sartor, H., ... & Lång, K. (2025). Screening performance and characteristics of breast cancer detected in the Mammography Screening with Artificial Intelligence trial (MASAI): a randomised, controlled, parallel-group, non-inferiority, single-blinded, screening accuracy study. The Lancet Digital Health, 7(3), e175-e183.