

A systematic review on the use of routine measurements in ovarian cancer prediction models, utilising data from electronic health records



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Introduction

- Ovarian cancer is one of the most common gynaecological cancers in women.
- Approximately 60% of cases are diagnosed at advanced stages (1).
- Due to its late diagnosis, the disease has a high rate of morbidity and mortality as well as a poor prognosis, with a 30% 5-year survival rate (2).
- Earlier detection of ovarian cancer is key in improving survival.

Aim of this review

- The aim of this review is to find significant and associative routine measurements (obtained from readily available electronic health records) which may prove beneficial in an earlier diagnosis of ovarian cancer.
- The purpose of identifying relevant routine measures is to flag up patients who are at risk of ovarian cancer earlier on in clinical practice so they can be referred for further testing, leading to an earlier diagnosis.



Methods

- This review followed the PRISMA (Preferred Reporting Items for Systemic Reviews and Meta-analysis) (3) .
- MEDLINE and EMBASE databases were searched using the OVID platform, with the search strategy shown in figure 1.
- Inclusion and exclusion criteria were applied (Table 1).
- The PRISMA flowchart of results obtained is shown in figure 2.
- Papers were identified between 1st January 2013 and 31st December 2023.
- English language restrictions were used to limit the search.
- One independent researcher extracted the following data from the studies :
 - Author
 - Year
 - Country
 - Electronic health record used in model
 - Performance of the prediction model
 - Performance of individual routine measures

- ovarian cancer.mp.
- prediction model.mp.
- machine learning.mp.
- exp ovarian cancer /
- 1 or 4
- 2 or 3
- 5 and 6
- limit 7 to (English language and last 10 years)

Figure 1. Search strategy used.

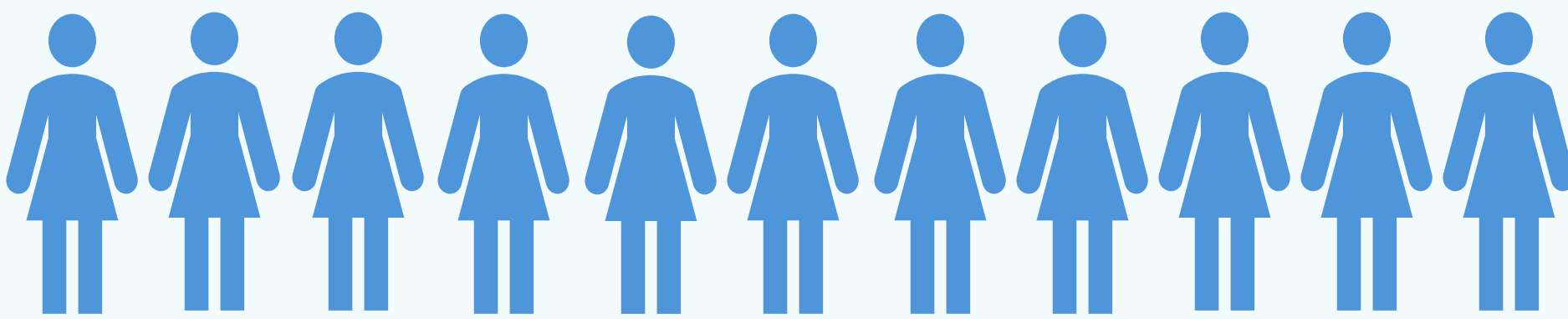
Inclusion criteria

- Study described the development of a prediction tool for ovarian cancer diagnosis
- Used electronic health records to provide the routine clinical data
- Data obtained from these databases was routine health data
- The paper provided sufficient data to allow the tool to be statistically analysed for its performance in predicting ovarian cancer.

Exclusion criteria

- Studies which predicted the risk of ovarian cancer compared to another comorbidity
- Any use of additional resources such as questionnaire/interviews
- Studies looking at recurrence or prognosis of ovarian cancer
- Review articles or conference abstracts
- Studies solely using tumour markers, imaging test results or data on genes.

Table 1. Inclusion and exclusion criteria used in the review.



11 women die of ovarian cancer every day (4)

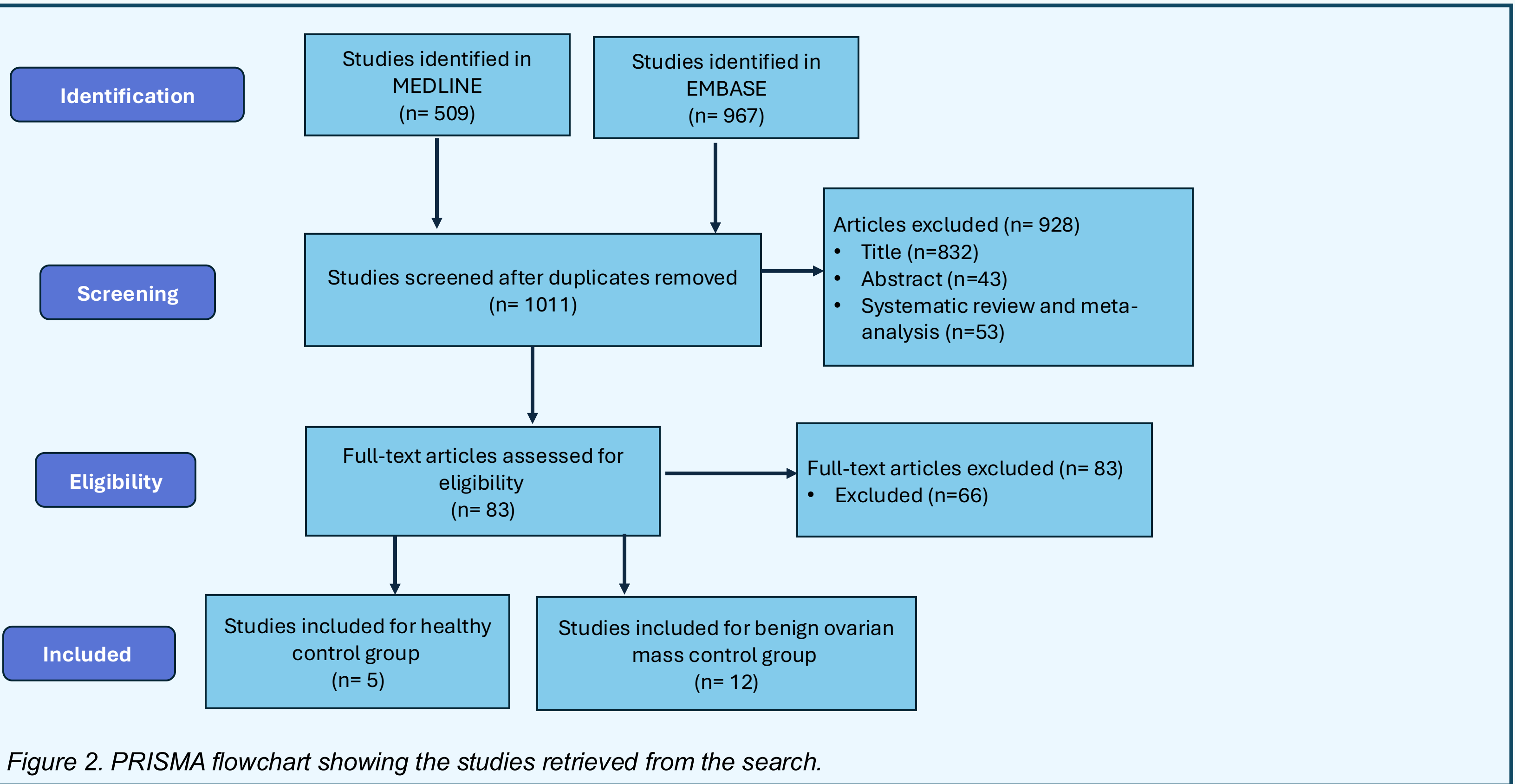


Figure 2. PRISMA flowchart showing the studies retrieved from the search.

Results

- We separated our results into 2 groups:
 - Group 1: studies with benign ovarian masses as the control group
 - Group 2: studies with healthy participants as the control group
- Five and twelve studies were found in each group, respectively.
- The main finding assessed was which routine measures were most relevant and significant in ovarian cancer diagnosis.
- A summary of the most prominent markers in the prediction models of each group of studies is found in figure 3.
- The performance of the prediction models was also examined.
- From the healthy controls cohort, the best performing models had sensitivities ranging from 72- 91.7% and specificities ranging from 83- 94.5%.
- From the benign pelvic mass cohort, the models had sensitivities ranging from 49.8- 100% and specificities ranging from 58.3- 99.27%.
- Across both groups, 5 studies created composed their own prediction models using routine measures whilst the remaining 12 used machine learning algorithms to create their prediction models.

Group 1

- Age
- Hemoglobin
- Family history of OC
- TTR (transerythin)
- Prolactin
- D-dimer
- Thrombin-antithrombin complex
- Prothrombin fragment

Group 2

- Age
- Haemoglobin
- Platelet count
- Albumin
- Plasma fibrinogen
- CRP
- LD
- NLR , PLR , LMR
- Neutrophil count

Figure 3. Most predictive measures found in the prediction models of the two groups of studies .

Conclusion

- Ovarian cancer is considered the most lethal gynaecological cancer and early diagnosis is an ongoing challenge.
- Using routine measures in ovarian cancer prediction is not only highly sensitive and specific, but also less invasive and easier, as routine data for patients is mostly readily available.
- Routine measures have shown promise in ovarian cancer prediction, with particular measures being more prominent than others.
- This review also sheds light onto the value of machine learning algorithms when working with large electronic healthcare datasets and their exceptional ability of recognising relevant patterns among data for disease prediction.

References

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