An overview of the interventions in the GP's office that motivate patients to participate in the screening of breast and cervical cancer: a systematic review.

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Master of Family Medicine

Masterproef Huisartsgeneeskunde
Academiejaar: 2025 – 2026

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ABSTRACT

Introduction

Almost one third of the cancer incidence in females is due to breast and cervical cancer. The screening programs in Belgium consist of a screening mammography every two years (50-69 years) and a cervical smear every three to five years (25-64 years). Multiple barriers exist for the participation in the screening programs. The aim of this study is twofold. Firstly, it is to provide an overview of the possible interventions a general practitioner (GP) can take to try and enhance the screening uptake. Secondly, it aims to clarify the role of the GP within these interventions.

Methods

For this systematic review, the following databases were consulted on 04/03/2025: Medline, Embase, Cochrane Library and Web of Science. Inclusion criteria were the following: the GP or GP's office, female patients between 25 and 70 years old, breast and cervical cancer, interventions to motivate patients to participate in the screening programs and the role of the GP in the screening programs. Exclusion criteria were the following: other languages than English or Dutch, different types of illness or diseases, other types of cancer than breast or cervical and hospital setting. Risk of bias was assessed using the *Cochrane RoB 2 tool*. *Endnote 21* was used to organize the included articles. Results were synthesized using *Microsoft Excel*.

Results

Out of 4814 articles, a total of 27 articles were included in this review. The qualitative analysis about the role of the GP consists of 14 articles of multiple study designs. Relevant quotations were extracted and summarized by type of cancer, then subdivided into five categories: having a GP, motivation and attitude of the GP, role of prevention, gender of the GP and prompting by the GP. The quantitative analysis about the effectiveness of the interventions consists of 13 articles: seven Randomised Controlled Trials (RCTs) and six cluster RCTs. Two about breast cancer, ten about cervical cancer and one about both types of cancer. All included RCTs and cluster RCTs were judged as an overall low risk of bias. Results show that for breast cancer screening, an audit and feedback tool and a signed reminder letter increased the screening uptake. For cervical cancer, self-sampling kits, scheduled appointments, a personal invitation letter and a multi-modal intervention to increase awareness all resulted in an increased screening uptake.

Discussion

An audit and feedback tool and personal invitation letters could prove useful for both breast and cervical cancer screening. The use of a self-sampling kit for HPV testing requires further investigation, but could prove useful in the future. The GP plays an important role in the screening programs for breast and cervical cancer. They can motivate patients by their attitude and by prompting and they have an important role as 'prevention adviser'. They should be aware of the influence of their gender on the screening participation.

INTRODUCTION

Cardiovascular disease was the leading cause of death globally in 2021 (1). Nevertheless, there were almost twenty million new cases of cancer worldwide in 2022 and 9,7 million people died due to this disease (2). Lung, prostate and colorectal cancer were the most common types of cancer in males (2). Breast, lung and colorectal cancer were the most common types of cancer in females, with cervical cancer at fourth place (2). Three screening programs exist for the early detection of colorectal, breast and cervical cancer.

Almost one third of the cancer incidence in females is due to breast and cervical cancer (2). There were 570.000 new diagnoses of cervical cancer worldwide and 311.000 women died due to this disease in 2018 (3). Almost 85% of these women came from low-income countries, due to a lesser organized screening program. In short: the richer the country, the less cervical cancer occurs (3). The opposite is true for breast cancer occurrence. 2.3 million women were diagnosed with breast cancer and 670.000 women died in 2022 (4). Breast cancer occurs in every country of the world, in women at any age after puberty, but with increasing rates in later life (4). It is striking that breast cancer occurs 2.25 times more in countries with a very high Human Development Index (HDI) than countries with a low HDI (4).

In contrast to the previous statement, cancer is still the number one cause of death in Belgium in 2023 (5). There were 11.192 new diagnoses of breast cancer in females and 641 new diagnoses of cervical cancer in 2022 (6). Cervical cancer is the fourth most important cancer in young females (25-44 years) (3). The screening program for breast cancer consists of a mammography every two years, for women between 50 and 69 years old (7). The estimated degree of screening in 2023 was 65,6% (8). The screening program for cervical cancer starts at 25 years old and ends at 64 years old. Women between 25 and 29 get a cervical smear each three years to check the cytology, women between 30 and 64 get a cervical smear each five years to detect the Human Papillomavirus (HPV) (9). 66,1% of the Belgian population participated in the screening program in 2023 (8). This implies that about 34% of the female Belgian population is not participating in the screening programs, even though they are in the right age range.

Multiple possible barriers for the participation in the screening programs have been investigated. The most common barriers found are: speaking another language, lack of knowledge about the procedure, lack of time, embarrassment for taking ones clothes off, fear of the test and fear of the result and having a male general practitioner (GP) (10-14). There is a shortage of recapitulatory articles about different interventions to overcome these barriers and improve the degree of screening. Furthermore, it is unclear which intervention is the most effective and how the general practitioner contributes to the screening programs.

The aim of this study is to provide an overview of the possible interventions a general practitioner can use to motivate patients to participate in the screening of breast and cervical cancer. These interventions are judged on effectiveness and the role of the general practitioner is evaluated.

METHODS

This review was written according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (15). Approval to perform this review was acquired by the "Onderwijs-BegeleidingsCommissie" (OBC) of the KU Leuven on 28/10/2024.

Search strategy

The research question is based on the SPIDER framework for mixed-method systematic reviews (16):

Which interventions within the general practitioner's office motivate patients to participate in the screening of breast and cervical cancer?

1. What is the effectiveness of these interventions?
2. What is the role of the general practitioner in these interventions?

The following databases were consulted on 04/03/2025: Medline, Embase, Web of Science and the Cochrane Library. The search was done without any limitations and the search string that was used is: (general practice OR general practitioner) AND (cancer screening OR early detection of cancer OR early diagnosis of cancer).

Inclusion and exclusion criteria

Selection was done by only one reviewer, using the PRISMA Flow Diagram for systematic reviews (15), based on the following inclusion criteria:

- The general practice or general practitioner
- Female patients between 25 and 70 years old
- Breast or cervical cancer
- Interventions to motivate patients to participate in the screening programs
- The role of the general practitioner in the screening programs

Exclusion criteria were the following:

- Languages other than English or Dutch
- Articles about different types of cancer than breast or cervical cancer (e.g. prostate cancer, colorectal cancer, melanoma…)
- Articles about other types of illnesses or diseases
- Hospital setting

Selection process

The research question consists of two components: a qualitative analysis about the role of the general practitioner and a quantitative analysis about the effectiveness of the

interventions. For the latter, only (cluster) RCTs were included in the analysis. After consulting the different databases, deduplication was done using *EndNote 21* as deduplication tool, searching for similar titles, authors, journals and years of publication. The articles were then screened on title and abstract using the criteria listed above, using the website *Rayyan.ai* as selection tool. Articles published before 2006 were excluded because of the large number of articles found, and in an attempt to keep this systematic review up-to-date and innovative.

Risk of bias assessment

The risk of bias of each RCT and cluster RCT was assessed by one reviewer using the *Cochrane RoB 2 tool* for risk of bias (17). Afterwards, a visual representation of the results was made using the *Robvis visualization tool* (18).

Data extraction

Study characteristics such as title, author, year of publication, journal and study design were summarized. The following data was extracted from the included RCTs and cluster RCTs for the quantitative analysis by one reviewer: land of origin, number of patients, age range of patients, duration of follow-up, which intervention was used, what was the control group, degree of screening in the control group and intervention group, odds ratio (OR), relative risk (RR) or absolute risk (AR), 95% confidence interval (CI) and p-value. Study outcome data was synthesized using *Microsoft Excel* in a well-organized table. Possible missing data was marked as such. For the qualitative analysis, multiple relevant quotations were extracted and synthesized by topic using *Microsoft Excel*.

RESULTS

Study selection

A total of 6927 records were identified from the different databases, of which 2113 duplicates were removed. This resulted in 4814 reports that were screened on title and abstract. 4645 were excluded based on the exclusion criteria mentioned above. Of the 169 studies remaining, 71 were excluded based on publication year, which resulted in 98 reports sought for retrieval. 24 reports were not retrieved, leaving 74 studies for full-text screening. 47 studies were excluded based on: the wrong publication type (n = 24), no intervention examined and nothing about the role of the GP (n = 20), the different types of cancer not distinguishable in the results (n = 2) and one duplicate (the same article published in two different years, with a slightly different title but the same content). Finally, 27 studies were included in this systematic review (14 for the qualitative analysis and 13 for the quantitative analysis). See Figure 1 for an overview of the flow diagram.

Study characteristics

14 articles were included in the qualitative analysis: seven cross-sectional studies, one observational study, one qualitative study, one focus group study, one population-based study, one mixed-methods sequential explanatory study, one in-depth examination and one model program. (Table 1) 13 articles were included in the quantitative analysis: 10 about cervical cancer, two about breast cancer and one about both types of cancer. Seven are RCTs and six are cluster RCTs. (Table 2)

Risk of bias assessment

The risk of bias of each included RCT or cluster RCT for the quantitative analysis was assessed using the *Cochrane Rob 2 Tool* by one reviewer (17). All included RCTs and cluster RCTs were judged as an overall low risk of bias and were included in this review. (Table 3 and 4)

Qualitative analysis

Multiple quotations from the included articles were summarized in Table 5 and 6. They were divided into two tables, one for cervical cancer and one for breast cancer, and subdivided into 5 different categories: having a GP, motivation and attitude of the GP, the role of prevention, gender of the GP and prompting by the GP.

For both breast cancer and cervical cancer, simply having a GP was an important factor in the screening uptake (19-22). When the GP showed a positive, enthusiastic attitude towards screening, women would be more motivated to participate in the screening programs (21, 23-25). It is clear that prevention is an important part of the GP's daily life (26-28). The more prompting done by the GP, the higher the chance of participation in

the screening programs (21, 25, 27, 29, 30). The gender of the GP is the only notable difference between breast and cervical cancer. Whereas for breast cancer, the gender of the GP plays only a small role (21); for cervical cancer, it seems like male GPs are less likely to perform smears themselves, resulting in lower participation rates (31, 32).

Quantitative analysis

Breast cancer screening

Three articles investigated interventions to increase breast cancer screening, one located in Canada and two in the USA. There was a significant increase in screening when a signed reminder letter by the GP was sent compared to the standard reminder letter, which would result in an increase of around 2,5% on the overall population attendance (33). A significant increase was also found when giving the GP a communication skills training and using an audit and feedback tool (34). The promotion of breast cancer screening using letters sent from the GP's office, automated phone calls and written prompt sheets did not result in a significant increase of screening after adjustment for differences in patient characteristics (35).

Cervical cancer screening

Ten articles investigated interventions to increase cervical cancer screening: two in the UK, two in France, two in Denmark, two in Norway, one in Belgium and one in New Zealand. Six articles investigated the use of self-sampling (SS) kits, either mailed at home or offered by the GP (36-41). The overall tendency of these results shows a preference for the home-mailed SS kit, with a significant increase in screening uptake. Two articles investigated sending invitation letters with scheduled appointments and both showed a significant increase in screening uptake (36, 42). One article showed an estimated increase of screening coverage of 6% in the population (42). However, the other article showed that the scheduled appointments did not remain significantly different after 18 months of follow-up (36). Combining three different techniques to increase awareness and thereby screening uptake (education of the GP, a mousepad and a poster in the waiting room) resulted in a significant increase of 2,6% in the screening participation (43). A personal invitation letter from the GP combined with education of the GP also resulted in a significant increase in screening uptake (44). Having a nurse to advise and support the patients did not increase the screening uptake (36). One article from the UK focused on 20-year-old women who received their first invitation letter (36). They investigated sending a pre-invitation leaflet to inform the patients better, but this did not result in an increased screening uptake. The possibility of booking an appointment online was also investigated but resulted again in no increase of screening uptake (36). Finally, the GPs receiving a list of their non-adherent patients next to the normal invitation letter, did not increase the screening uptake. However, after post-hoc analysis, when only looking at the non-adherent patients at inclusion, this intervention increased the screening uptake significantly with 9% (OR 1,70) (45).

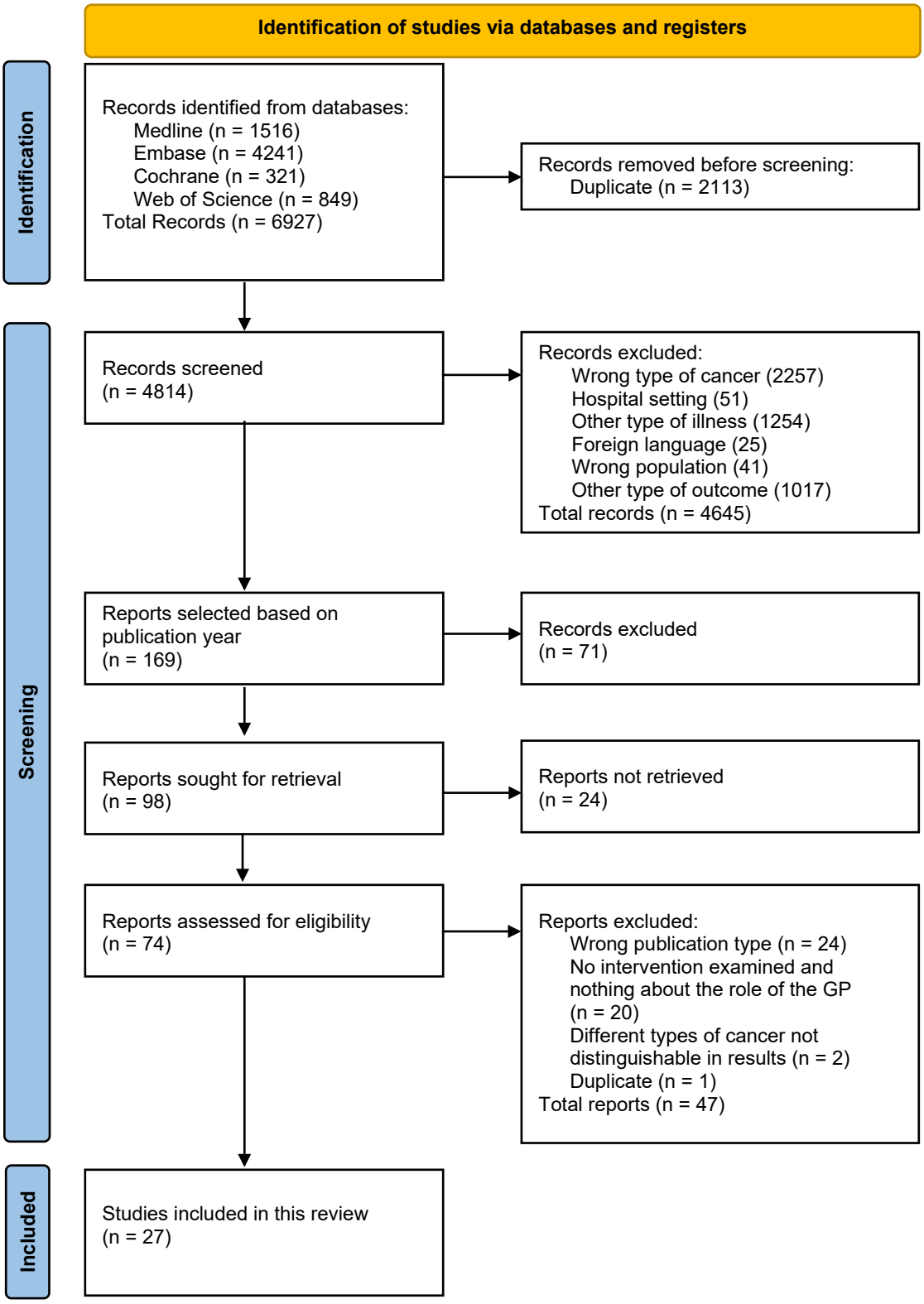


Figure 1 – PRISMA 2020 Flow diagram for new systematic reviews (15)

Title	Authors	Year	Journal	Study Design
Breast cancer screening in France: results of the EDIFICE survey	X. Pivot, O. Rixe, JF. Morere, Y. Coscas, et al.	2008	International Journal of Medical Sciences	Observational study
Cancer Screening adherence: Does physician-patient communication matter?	S. A. Fox, J. Heritage, S. E. Stockdale, S. M. Asch, et al.	2009	Elsevier Ireland Ltd. - Patient education and counselling	Cross-sectional analysis
General practitioners can increase participation in cervical cancer screening - a model program in Hungary	A. Gyulai, A. Nagy, V. Pataki, D. Tonté, et al.	2018	BMC Family Practice	Model program
Having a personal healthcare provider and receipt of adequate cervical and breast cancer screening	R. Cardarelli, A. K. Kurian, V. Pandya	2009	Journal of the American Board of Family Medicine	Cross-sectional study
Identifying ways to maximise cervical screening uptake: a qualitative study of GP's and practice nurses' cervical cancer screening-related behaviours	M. O'Connor, L. A. McSherry, S. U. Dombrowski, J. J. Francis, et al.	2021	HRB Open Research	Qualitative study
Is Canadian women's breast cancer screening behaviour associated with having a family doctor?	B. Poole, C. Black, K. Gelmon, L. Kan	2010	Canadian family Physician	Cross-sectional study
Link between the referring physician and breast and cervical cancers screening: a cross-sectional study in France	L. Ouanhnon, M. R. Bugat, V. Druel, P. Grosclaude, et al.	2023	BMC Primary Care	Cross-sectional study
Motivators for women to attend cervical screening: the influential role of GPs	M. O'Connor, J. Murphy, C. Martin, J. O'Leary, et al.	2014	Family Practice	Focus groups
Pap testing in a high-income country with suboptimal compliance levels: a survey on acceptance factors among Sicilian women	V. Restivo, C. Costantino, A. Marras, G. Napoli, et al.	2018	International Journal of Environmental Research and Public Health	Cross-sectional study
Participants, physicians or programmes: participants' educational level and initiative in cancer screening	B. Willems, P. Bracke	2018	Elsevier B.V. - Health Policy	In-depth examination
Perceptions and beliefs of general practitioners on their role in the cancer screening programmes in the Netherlands: a mixed-methods study	T. H.G. Bongaerts, F. L. Büchner, V. Nierkens, M. R. Crone, et al.	2024	BMC Primary care	Mixed-methods sequential explanatory study
The association between general practitioners' attitudes towards breast cancer screening and women's screening participation	L. F. Jensen, T. O. Mukai, B. Andersen, P. Vedsted	2012	BMC Cancer	Population-based study
The effect of cervical smears performed by general practitioners on the cervical cancer screening rate of their female patients: a claim database analysis and cross-sectional survey	J. Favre, M. Rochoy, T. Raginel, M. Pelletier	2018	Journal of women's health	Database analysis and cross-sectional survey
The role of family physicians in the prevention and early detection of cancer in Herzegovina-Neretva and West-Herzegovina Canton	I. Marijanovic, M. Kraljevic, D. B. Glibo, T. Buhovac, et al.	2021	Medicina Academica Mostariensia	Cross-sectional observational study

Table 1 – Overview of the included articles for the qualitative analysis.

Title	Authors	Year	Journal	Study design	Type of cancer
A cluster randomised trial of strategies to increase cervical screening uptake at first invitation (STRATEGIC)	H. C. Kitchener, M. Gittins, O. Rivero-Arias, A. Tsiachristas, et al.	2016	Health Technology Assessment	Cluster RCT	Cervical
A home-mailed versus general practitioner-delivered vaginal self-sampling kit for cervical cancer screening: a cluster randomized controlled trial with a cost-effectiveness analysis	J. Boyard, A. Caille, S. Brunet-Houdard, S. Sengchanh-Vidal, et al.	2022	Journal of Women's Health	Cluster RCT	Cervical
A primary healthcare-based intervention to improve a Danish cervical cancer screening programme: a cluster randomised controlled trial	H. Jensen, H. Svanholm, H. Stovring, F. Bro	2009	Journal of Epidemiology & Community Health	Cluster RCT	Cervical
Acceptability of human papillomavirus (HPV) self-sampling among never- and underscreened Indigenous and other minority women: a randomised three-arm community trial in Aotearoa New Zealand	N. Brewer, K. Bartholomew, J. Grant, A. Maxwell, et al.	2021	Elsevier Ltd. - The Lancet Regional Health, Western Pacific	RCT	Cervical
Comparative effectiveness of audit-feedback versus additional physician communication training to improve cancer screening for patients with limited health literacy	E. G. Price-Haywood, J. Harden-Barrios, L. A. Cooper	2014	Journal of General Internal Medicine	Cluster RCT	Breast & cervical
Effect of an intervention in general practice to increase the participation of immigrants in cervical cancer screening: a cluster randomized clinical trial	K. A. Moen, B. Kumar, J. Igland, E. Diaz	2020	JAMA Network Open	Cluster RCT	Cervical
Efficacy of strategies to increase participation in cervical cancer screening: GPs offering self-sampling kits for HPV testing versus recommendations to have a pap smear taken: a randomised controlled trial	E. Peeters, K. Cornet, D. Devroey, M. Arbyn	2020	Elsevier B.V. - Papillomavirus Research	RCT	Cervical
Impact of scheduled appointments on cervical screening participation in Norway: a randomised intervention	S. Lönnberg, T. Andreassen, B. Engesæter, R. Lilleng, et al.	2016	BMJ Open	Randomised health service study	Cervical
Non-speculum sampling approaches for cervical screening in older women: randomised controlled trial	R. Landy, T. Hollingworth, L. AV. Marlow, J. Rigney, et al.	2021	British Journal of General Practice	RCT	Cervical
Organized cervical cancer screening: a randomized controlled trial assessing the effect of sending invitation letters	D. Teigné, A. Banaszuk, C. Grimault, A. Lebon, et al.	2024	Elsevier Inc. - Preventive Medicine	Cluster RCT	Cervical
Preventing cervical cancer using HPV self-sampling: direct mailing of test-kits increases screening participation more than timely opt-in procedures: a randomized controlled trial	M. Tranberg, B. H. Bech, J. Blaakær, J. S. Jensen, et al.	2018	BMC Cancer	RCT	Cervical
Randomized, controlled trial of a multimodal intervention to improve cancer screening rates in a safety-net primary care practice	S. Hendren, P. Winters, S. Humiston, A. Idris, et al.	2013	Journal of General Internal Medicine	RCT	Breast
Signed family physician reminder letters to women overdue for screening mammography: a randomized clinical trial	E. K. Chan, C. Wilson, S. Tyldesley, I. A. Olivotto, et al.	2018	Journal of Medical Screening	RCT	Breast

Table 2 – Overview of the randomised controlled trials included in the quantitative analysis.

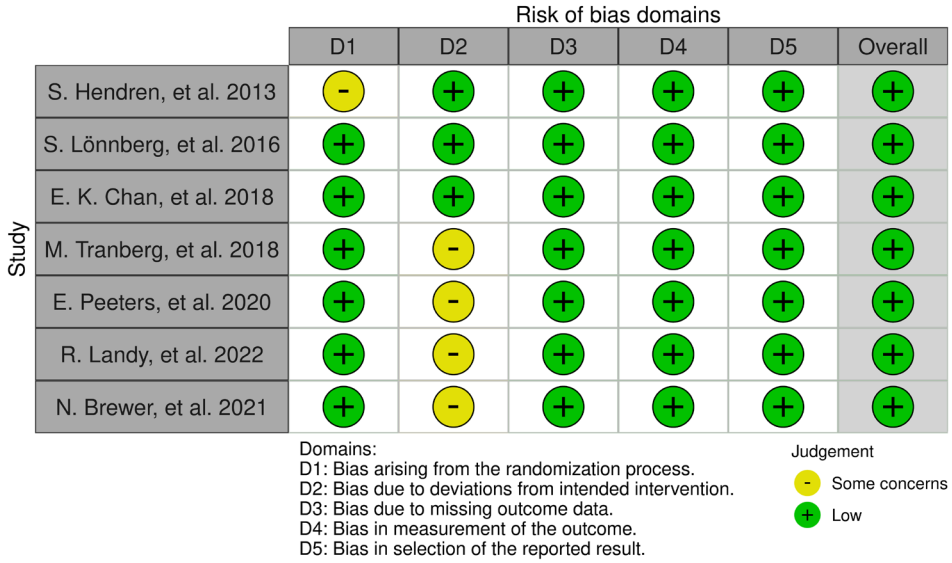


Table 3 – Risk of bias assessment of the included RCTs for the quantitative analysis, made by the use of the *Robvis visualization tool* (18).

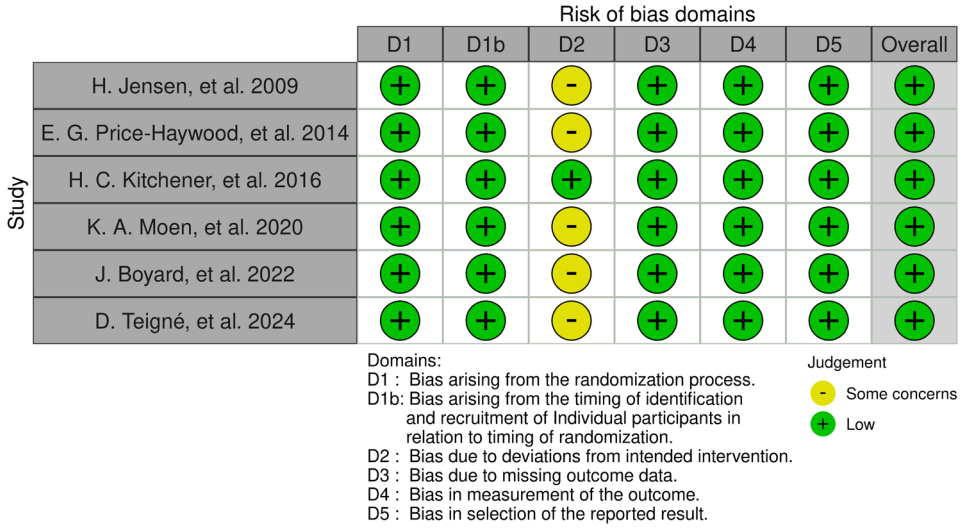


Table 4 – Risk of bias assessment of the included cluster RCTs for the quantitative analysis, made by the use of the *Robvis visualization tool* (18).

Topic	Quotation	Article
Having a GP	“The major factors related to the realization of a screening mammography were: consultation within the last 12 months by a GP (adjusted OR = 3,19) … "	X. Pivot, 2008.
	“We found that seeing a family doctor in the past 12 months more than doubles the odds of having had a screening mammogram in the past 2 years.”	B. Poole, 2010.
Motivation and attitude of the GP	"The major factors related to the realization of a screening mammography were: … feeling motivated to undergo a breast cancer screening (adjusted OR = 7,71).”	X. Pivot, 2008.
	“This study finds that the discussion of cancer screening positively influences patient use of screening, and even more so when physicians communicate with patient-perceived enthusiasm about screening.”	S. A. Fox, 2009.
	“Women were statistically significantly more likely to be non-participants if their GP had a negative attitude towards screening than women registered with a GP with a positive attitude.”	L. F. Jensen, 2012.
	"Main significant reasons for not performing the screening test every 2 years were: feeling unconcerned and/or unmotivated (p=0,0001) … "	X. Pivot, 2008.
Role of prevention	"The cancer screening programmes (CSPs) were stated as an important and repeating topic in daily practice, and most GPs receive questions regarding the CSPs on a regular basis."	T. H. G. Bongaerts, 2024.
	“The majority of them agreed to advise patients on the link between a healthy lifestyle and reduced cancer incidence, existing screening programs, early symptoms and signs of cancer, to take and record family history, all for the cost-effectiveness of breast cancer screening.”	I. Marijanovic, 2021.
	"Participation in cervical cancer screening more than triples the likelihood of recent breast cancer screening mammograms."	B. Poole, 2010.
Gender of GP	"Gender was the major factor linked with a variation of recommendations: 73,1% versus 65,4% among female and male physician systematically recommend a screening, respectively (p=0,025)."	X. Pivot, 2008.
Prompting by GP	“The decision of women with less education to undergo mammograms were also more likely to be guided by their treating physicians than by their own initiative.”	B. Willems, 2018.
	"Main significant reasons for not performing the screening test every 2 years were: … and no recommendation by the GP (p=0,015)."	X. Pivot, 2008.

Table 5 – Quotations for the qualitative analysis about breast cancer screening.

Topic	Quotation	Article
Having a GP	"… having a PHP[1] and health insurance are 2 important independent factors associated with adequate cervical and breast cancer screening… "	R. Cardarelli, 2010.
	"… patients with a designated RP[2] had a significantly higher uptake of breast and cervical cancers screening than those without."	L. Ouanhnon, 2023.
Motivation and attitude of the GP	"… practitioners considered it their responsibility to encourage women to have smears … "	M. O'Connor 2021.
	"… women's cervical screening behaviours are greatly influenced by their GP, both positively and negatively."	M. O'Connor, 2014.
	"… a positive attitude by their GP towards cervical screening strongly influenced their likelihood of having a smear."	M. O'Connor, 2014.
Role of prevention	"GP/FP plays an important role in prevention."	I. Marijanovic, 2021.
	"The cervical cancer screening participation rate was higher when women receive care from GPs who perform cervical smears, rather than depending on a gynaecologist for screening."	J. Favre, 2018.
	"Our results highlight the pivotal role of GPs, as physicians were identified as the primary initiators of participation in screening for cervical, breast and colorectal cancer across the EU-28."	B. Willems, 2018.
Gender of GP	"… but smeartaking was viewed as a predominantly female role."	M. O'Connor 2021.
	"Out of 343 GPs, 182 (53,1%) reported performing cervical smears themselves, 79,7% in female GPs versus 45,7% in males."	J. Favre, 2018.
	"The gender of the GP also significantly influenced screening participation percentages, the mean rate in female GPs being greater than for males."	J. Favre, 2018.
	"In multivariate analysis, the effect of the gender of the GP, generally described in the literature, was not found significantly associated to the percentage of participation to cervical cancer screening."	J. Favre, 2018.
Prompting by GP	"Of the successful cases, there were 17 occasions in which a letter from the general practitioner was sufficient and 7 instances in which a personal conversation changed the mind of the participant."	A. Gyulai, 2018.
	"… a quarter of the women who typically did not take part in cervical cancer screening underwent the screening after advice from their general practitioner."	A. Gyulai, 2018.
	"Prompting by GPs motivated the women in our study to attend cervical screening. Some women described how invitation and reminder letters were effective in encouraging them to attend."	M. O'Connor, 2014.
	"… for 48% of responding women, … GPs' advice … had an important role for awareness."	V. Restivo, 2018.
	"… the most relevant source of information on Pap testing (94%) was a healthcare provider."	V. Restivo, 2018.

Table 6 - Quotations for the qualitative analysis about cervical cancer screening.

[1] PHP = Primary healthcare physician, [2] RP = Referring physician

	Country	N° of patients	Age range (years)	Intervention	Follow-up	Degree of screening prior to intervention / in control group	Degree of screening after intervention	OR/RR/AR	CI	p-value
Cervical cancer										
H. C. Kitchener, et al. 2016.	UK	20879	20 years	Online booking vs. no online booking	6 months	No online booking group: 26,6%	Online booking group: 28,8%	OR 1,09	(0,94-1,28)	p = 0,242
				Pre-leaflet vs. no pre-leaflet		No pre-leaflet group: 30,6%	Pre-leaflet group: 31,1%	OR 1,01	(0,93-1,10)	p = 0,747
		10126 non-attenders	20,5 years	Home-mailed SS[1] kit	6 months	Control group: 16,2%	Home-mailed SS[1] group: 21,3%	OR 1,51	(1,20-1,91)	Significant
				SS[1] kit offered by GP			GP delivered SS[1] group: 16,2%	/	/	Not significant
				NN[2] to advice and support			NN[2] group: 14,5%	/	/	Not significant
				Timed appointment			Timed appointment group: 19,8%	OR 1,4	(1,14-1,74)	Significant
				Choice between NN[2] or timed appointment			Choice group: 18,8%	/	/	Not significant
J. Boyard, et al. 2022.	France	3612	30-65	Home-mailed SS[1] kit vs. GP-delivered SS[1] kit	9 months	Home-mailed group: 27,9%	GP-delivery group: 14,9%	AR -13%	(-15,9- -10)	p < 0,001
H. Jensen, et al. 2009.	Denmark	14979	23-59	Usual care vs. personal invitation letter by GP + GP receives visit by facilitator	9 months	64% in control group	66,5% in intervention group	Absolute difference 2,5%	(-0,3%-5,3%)	Significant
N. Brewer, et al. 2021.	New Zealand	3553	30-69	Mailed SS[1] kit at home vs. SS[1] at clinic vs. usual care (normal Pap-smear)	3 months	Usual care group: 2,7%	SS[1] at clinic group: 6,4%	/	/	p = 0,002
							SS[1] kit at home group: 14%	/	/	p < 0,0001
K. A. Moen, et al. 2020.	Norway	10360	25-69	Education of GP + mousepad reminder + poster waiting room vs. no intervention	6-12 months	Control group: 51,3%	Intervention group: 55,6%	OR 1,19	(1,06-1,34)	Significant
E. Peeters, et al. 2020.	Belgium	88	25-64	GP offering SS[1] kit vs. encouragement by GP	6 months	Encouragement by GP group: 51%	SS[1] kit group: 78%	Adjusted OR 3,41	(1,31-8,87)	p = 0,012
S. Lönnberg, et al. 2016.	Norway	1036	27-69	Reminder letter with scheduled appointment vs. standard reminder letter	6 months	Standard letter: 20%	Letter with scheduled appointment: 37,3%	RR 1,86	(1,52-2,29)	Significant
R. Landy, et al. 2021.	UK	784	50-64	Invitation letter with SS[1] kit postal order vs. standard invitation letter	12 months	Standard invitation letter: 13,6%	Letter with SS[1] kit order: 30,5%	Absolute difference 17%	(11,3%-22,7%)	p < 0,001

	Country	N° of patients	Age range (years)	Intervention	Follow-up	Degree of screening prior to intervention / in control group	Degree of screening after intervention	OR/RR/AR	CI	p-value
D. Teigné, et al. 2024.	France	148.510	40-65	Opportunistic screening vs. organized screening (invitation letter) vs. optimized screening (invitation letter + GP receives list of non-adherent patients)	6 months	Opportunistic screening group: 61,8%	Optimized screening group: 63,6%	OR 1,05	(0,93-1,18)	p = 0,44
				Post-hoc analysis: only non-adherent patients at inclusion		Opportunistic screening group: 11,2%	Optimized screening group: 17,9%	OR 1,7	(1,56-1,86)	p < 0,001
M. Tranberg, et al. 2018.	Denmark	9791	30-64	Direct mailing of HPV SS[1] kit vs. opt-in invitation for SS[1] kit vs. standard reminder	6 months	Standard reminder group: 25,2%	Direct mailing group: 38%	RR 1,51	(1,40-1,62)	/
							Opt-in group: 30,9%	RR 1.23	(1,13-1,32)	/
Breast cancer										
S. Hendren, et al. 2013.	USA	191	40-75	Letters to patients + automated phone calls + point-of-care prompts vs. standard care	12 months	Standard care group: 16,7%	Intervention group: 29,7%	Adjusted OR 1,96	(0,87-4,39)	Not significant
E. K. Chan, et al. 2018.	Canada	5498	51-73	Signed letter from GP vs. standard reminder letter	6 months	Standard reminder letter: 24%	Signed letter from GP: 34,4%	Adjusted RR 1,41	(1,30-1,54)	p < 0,001
Both types of cancer										
E. G. Price-Haywood, et al. 2014.	USA	168	40-75	Communication skills (CS) training GP + audit and feedback vs. audit and feedback only	12 months	Mammography: CS + audit group: 22,3%	CS + audit group: 43,3%	/	/	Significant
						Audit only group: 35,1%	Audit only group: 63,2%	/	/	
						Pap-smear: CS + audit group: 20,2%	CS + audit group: 34,4%	/	/	Not significant
						Audit only group: 10,8%	Audit only group: 20%	/	/	

Table 7 – Study outcome results for the quantitative analysis.

[1] SS = Self-sampling, [2] NN = Nurse navigator

DISCUSSION

Role of the general practitioner in the screening programs for breast and cervical cancer

Having a GP

An important independent factor related to the participation of women in the screening programs, is simply 'having a general practitioner'. For breast cancer screening, two studies show a significant increase in participation rates for mammography when the patient has had a visit with the GP in the past 12 months (21, 22). A similar association is found for cervical cancer, where patients with a GP have a higher uptake of cervical smears than those without (19, 20).

Although this association does not give us a causal link between having a GP and screening uptake, it does show us that the general practitioner plays an important role in the national screening programs. Regular visits to the GP are associated with a higher chance of increased screening uptake. Despite the shortage of GPs in Belgium (with a mean of 8,35 GPs per 10.000 patients), 85% of the patients had at least one consultation with their GP in 2022 (46, 47). Increasing the number of GPs could therefore have a positive impact on the screening uptake, if this percentage were to grow even more.

Motivation and attitude of the GP

When patients feel motivated to undergo a screening mammography, they are 7,7 times more likely to participate (21). This feeling is greatly influenced by the attitude of the general practitioner: when the GP communicates with enthusiasm about the screening program, women are more likely to participate (23); when the GP has a negative attitude towards screening, women are significantly less likely to participate (24). This positive and negative influence of the attitude of the GP is also true for cervical cancer screening uptake. A positive attitude of the GP strongly influences the likelihood of having a cervical smear (25).

This suggests that the general practitioner has a greater influence on the motivation of women to participate in the screening programs than initially expected. It is important to be aware of this influence and to show a positive attitude towards the screening programs in order to motivate more women. This is only a minor adjustment to take into account as a GP, but it could have a large impact on the screening participation rates.

Role of prevention

It has become increasingly clear in the last few years that prevention is an important role of the general practitioner in his daily practice (26). GPs indicate that they receive questions about cancer screening programs on a regular basis (28). Alongside the screening programs, they also try to advise patients on the link between a healthy lifestyle and reduced cancer incidence and on early symptoms of cancer. They take a

family history in order to estimate the risk and need for cancer screening (26). One study highlighted the pivotal role of GPs, as they were identified as the primary initiators of participation in screening for cervical and breast cancer across the EU-28 (27). Another study found that GPs who performed cervical smears themselves, had a higher participation rate for cervical cancer screening than GPs who relied on the gynaecologist (32).

This result shows that, as a general practitioner, it is not only important to motivate women to participate, but it is also important to carry out the role of 'prevention adviser'. The GP should offer the possibility of taking the cervical smear at the GP's office rather than going to the gynaecologist (who often have a longer waiting time).

Gender of the GP

There is a limited influence of the gender of the general practitioner on the recommendation of screening mammography: 73,1% versus 65,4% among female and male GPs respectively, systematically recommended screening (21). The influence of the gender of the GP becomes larger for cervical cancer screening. When interviewing GPs, smeartaking was viewed as a predominantly female role and only 45,7% of the male GPs reported performing cervical smears themselves, compared to 79,7% in female GPs (31, 32). This difference also translates to a greater screening participation of patients from a female GP than from a male GP. However, one study found that, after multivariate analysis, this effect of the gender of the GP was not significantly associated with the participation rates of cervical cancer screening (32).

More research needs to be done to better understand why male GPs perform less cervical smears. Are female patients more hesitant to let a male GP take their cervical smear? Do male GPs feel more insecure because they are less experienced? Nevertheless, smeartaking should not be viewed as a predominantly female role but as a part of the job of every general practitioner, regardless of gender. When the reason behind this inequality is better understood, actions can be taken to try and enhance the participation rates of patients with a male GP.

Prompting by the GP

Prompting or encouraging patients to participate in the screening programs is an important part of being a general practitioner. Women who are less educated are more likely to be guided by their GP to undergo mammography than by their own initiative (27). The lack of recommendation from the GP is a main reason for some women not to participate in the screening mammography (21). The general practitioner is also an important source of information on cervical cancer screening (30). He/she has an important role in awareness about the screening program and prompting by the GP can motivate women to participate (25, 30). Prompting by using invitation or reminder letters can encourage women to take part in the cervical screening program (25, 29).

Interventions to increase breast cancer screening

There is a limited number of articles about interventions to increase breast cancer screening in the GP's office. One study in Canada with almost 5500 patients compared a signed letter from the GP to a standard reminder letter and found a significant increase in screening participation with the signed letter after six months (33). Another study in the USA compared standard care to a multimodal intervention (a personal letter to the patients + automated phone calls + point-of-care prompts) but found no significant increase in participation rate after one year. However, this study was a lot smaller (only 191 patients) and in the standard care group 16,7% had undergone a screening mammography compared to 29,7% in the multimodal intervention (35). Even though the results are mixed, a small increase was found in both studies after a (signed) personal letter from the general practitioner. Using current technology and computer programs in the general practitioner's office, sending an electronic personal invitation letter requires low effort but could still enhance the participation rate. More studies are needed to investigate whether it actually increases the screening uptake.

Another study in the USA compared the use of an audit and feedback tool to the combination of this audit and feedback tool with communication skills training of the GP. There was a significant increase in screening participation in both groups (34). An audit and feedback tool on its own could therefore be a useful tool in the general practitioner's office. The medical records would be audited once or twice a year and the GP receives a list of all eligible patients for screening.

Interventions to increase cervical cancer screening

Self-sampling kits for the detection of the Human Papillomavirus are becoming a popular research topic. Six studies investigated their influence on the screening participation rates. Three studies compared a home-mailed self-sampling kit to a self-sampling kit offered by the general practitioner (36-38). There was an obvious preference for the home-mailed self-sampling kit, but in most studies, self-sampling kits offered by the GP also increased the screening uptake only to a lesser extent. One study in Belgium compared a self-sampling kit offered by the GP to encouragement by the GP. After six months, the screening participation in the intervention group was 78% compared to 51% in the control group (39). This was a small study with 88 participants, but showed a great potential. Another study compared a standard invitation letter with an invitation letter containing a postal order for a self-sampling kit. After 12 months, there was a significant absolute difference of 17% in participation rate favouring the letter with the postal order (40). Finally, one study compared direct mailing of self-sampling kits to an opt-in invitation for self-sampling kits and to a standard reminder letter (41). A significant increase was found in both intervention groups, with the largest increase in the direct-mailing group.

Despite of all the research already done, there is no clear consensus on the accuracy of self-sampling kits compared to physician-taken samples. Some studies have shown a slightly lower sensibility of high risk HPV testing on the self-collected samples (48). Other studies showed a comparable result between self-collected and physician-taken samples (49, 50). In Belgium, women between 30 and 64 years old get a cervical smear taken by a physician to test for the Human Papillomavirus. Current guidelines do not include self-sampling kits, even though they could be used to try and target underscreened women or women not participating in the regular screening program. More research is needed to find a consensus on the use of self-sampling kits in the screening program. If self-sampling kits turn out to have a similar accuracy compared to physician-taken samples, this could lower the barrier for some women who feel embarrassed to let a physician take their cervical smear.

Two studies investigated the use of an invitation letter with a scheduled appointment compared to a standard invitation letter (36, 42). In both studies, a significant increase was found in the participation rate of cervical cancer screening after six months when using a letter with a scheduled appointment. Timed appointments are already being used in Belgium for breast cancer screening, with the 'Mammobiel' bus riding around the country and women getting an invitation every two years for their mammography. Could this become a way to increase screening participation for cervical cancer in the future? Using the principles of the 'Mammobiel', where a physician or trained nurse performs the cervical smears in a bus riding around the country? More research is needed to investigate whether female patients would be willing to participate in this form of screening. Another possibility would be that every general practitioner's office reserves some spots in their calendar to invite patients with scheduled appointments. However, if these women don't show up, the GP is missing out on income and other patients could not be helped even though there was a spot available. Thus, this approach could be more difficult to implement in the daily practice of the GP.

One study in Norway with 10.360 patients investigated additional education of the GP and tools for prompting (mousepad + poster in the waiting room) compared to the usual care. A small but significant result was found in the intervention group (43). This result shows that small adaptations in the GP's office could make a bigger impact, as we know that prompting by the GP can motivate people to participate.

Finally, one study in Denmark found a significant increase in screening uptake after the use of personal invitation letters (44). After nine months, a significant increase of 2,5% was found in screening uptake. Automatically sending invitation letters from the GP's office using the current computer programs, could result in an increase in screening uptake. The possibility of an audit and feedback tool, just as with the mammography screening, could be useful to download a list of potential patients eligible for screening.

When comparing to other literature, one systematic review is found concerning primary care practice-based interventions to enhance screening uptake for cervical, breast and colorectal cancer (51). Similarly to the results of this study, a positive effect on the screening participation is found when using an audit and feedback tool, provider reminders and patient education. A multi-component approach with the combination of all the previous interventions would be the most effective. No other systematic reviews were found regarding this specific topic, which highlights the limited research available.

Strengths and limitations

This systematic review was executed by only one reviewer. Even though the screening of articles and the evaluation of the risk of bias was done with the upmost care, a second reviewer would have made the clinical implications more trustworthy. This review investigated every possible intervention that could be implemented in the general practitioner's office regarding the screening uptake for female cancer screening. By using only (cluster) RCTs for the quantitative analysis, an unambiguous result for every intervention could be achieved.

CONCLUSION

General practitioners play an important role in the cancer screening programs for breast and cervical cancer. They can motivate women by their attitude and by prompting. They can build a trustworthy relationship with their patients over the years and have a pivotal role as 'prevention adviser'. GPs should be aware of the influence of their gender and regardless of this, try and motivate their patients.

Multiple interventions can be combined to try and increase cancer screening uptake. The combination of an audit and feedback tool with the use of personal invitation letters can be a useful tool for both cervical and breast cancer screening. The use of self-sampling kits for cervical cancer screening needs to be further investigated but could prove useful in the future.

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