Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

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Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

Kevin Selby\(^1\), Jacques Cornuz\(^1\), David Gachoud\(^2\), Jean-Luc Bulliard\(^3\), Cristina Nichita\(^4\), Gian Dorta\(^4\), Cyril Ducros\(^5\), Reto Auer\(^1\)

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Original research article

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1 Table and 3 Figures

48 references

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Abstract:

Objectives: Primary care physicians (PCPs) should prescribe fecal immunochemical testing (FIT) or colonoscopy for colorectal cancer screening based on their patient’s values and preferences. However, there are wide variations between PCPs in the screening method prescribed. The objective was to assess the impact of an educational intervention on PCPs’ intent to offer FIT or colonoscopy on an equal basis.

Design: Survey before and after training seminars with a parallel comparison through a mailed survey to PCPs not attending the training seminars.

Setting: All PCPs in the canton of Vaud, Switzerland

Participants: Of 592 eligible PCPs, 133 (22%) attended a seminar, of which 106 (80%) filled both surveys. 109 (24%) PCPs who did not attend the seminars returned the mailed survey.

Intervention: A 2-hour-long interactive seminar targeting PCP knowledge, skills and attitudes regarding offering a choice of CRC screening options.

Outcome measures: The primary outcome was PCP intention of having their patients screened with FIT and colonoscopy in equal proportions (between 40 and 60% each). Secondary outcomes were the perceived role of PCPs in screening decisions (from paternalistic- to informed- decision making) and correct answer to a clinical vignette.

Results: Before the seminars, 9% of PCPs reported that they had equal proportions of their patients screened for CRC by FIT and colonoscopy; after the seminar, 36% foresaw having their patients screened in equal proportions (absolute difference 27%, p<0.001). Among those not attending, there was no change (13% vs 14%). Of those attending, there was no change in their perceived role in screening decisions, while the proportion responding correctly to a clinical vignette increased (88% to 99%, p=0.04).

Conclusions: An interactive training seminar increased the proportion of physicians with the intention to prescribe FIT and colonoscopy in equal proportions.

Abstract word count: 287 words (300 max)
Strengths and limitations of this study:

- The training seminars were organized within the implementation of a statewide organized screening program.
- All primary care physicians in canton Vaud, Switzerland were invited to attend the seminars. All those not attending were mailed a survey.
- Twenty two percent of PCPs attended the seminars and 24% not attending returned the mail survey; there was no randomization of PCPs to the intervention, limiting causal inference.
- We only measured changes in intentions to prescribe and verified prescription rates are needed.
Introduction

Screening for colorectal cancer (CRC) reduces CRC mortality and is widely recommended beginning at age 50\(^1\)\(^2\). The recommended methods for CRC screening each have varying test characteristics\(^3\); while colonoscopy has high sensitivity for both cancerous and pre-cancerous lesions, allowing screening every 10 years, it is invasive and carries a risk of bleeding\(^4\). Fecal immunochemical testing (FIT) for occult blood on the other hand has lower sensitivity for pre-cancerous adenomas, but can be performed at home without preparation and has higher acceptability than colonoscopy\(^5\)\(^-\)\(^7\). Studies have suggested that in real-world settings the performance of FIT and colonoscopy for detecting cancers are equivalent, making both reasonable first-line choices for screening\(^6\)\(^,\)\(^8\).

In contexts where more than one reasonable choice exists, preferences become important\(^9\). Some patients might prefer colonoscopy, thereby accepting a more burdensome screening modality than FIT, while others might prefer FIT, accepting its reduced precision as compared to colonoscopy. Extensive literature has revealed wide geographic variations in the use of preference-sensitive conditions, including CRC screening method\(^10\), that are not explained by differences in patient preferences, but rather by physician preferences and local medical culture\(^11\). These differences persist when looking at the level of individual physicians, not just geographic areas\(^12\). Shared decision making (SDM) might help reduce these unacceptable variations by increasing patient participation in decisions\(^12\)\(^,\)\(^13\). Patients’ preferences towards a screening modality are expected to vary between patients in a primary care practice. Preference diagnosis by physicians might lead to increase in variation within practices, while reducing variation in care between practices\(^9\).

The Health Department of the canton of Vaud has recently decided to launch the first systematic, statewide, organized CRC screening program that will offer both FIT and colonoscopy to the entire eligible population via a discussion with their primary care physician (PCP)\(^14\). A decision aid will be mailed informing citizens of the program, the available screening modalities, and encourage discussion with their PCP. Baseline surveys of PCPs in the canton suggest wide variations in baseline PCP preferences, with a predilection for colonoscopy\(^15\)\(^,\)\(^16\). International literature suggests that physician preference for colonoscopy translates into recommendations to patients focused on colonoscopy alone, with
little mention of other screening modalities\cite{17,18}; this could have negative effects on patient participation and independence\cite{18-21}. Given the stated goal of the screening program to enable participants to choose between colonoscopy and FIT on an equal basis, reducing variation in care between PCP practices is key.

We administered training seminars for PCPs from the Canton Vaud prior to the beginning of the screening program. The objectives of the seminar were to improve PCPs knowledge, provide skills and tools needed for SDM with patients, and change the attitudes of PCPs regarding the importance of incorporating patient preferences in CRC screening decisions (supplementary figure 1). We hypothesized that such an intervention would increase the number of PCPs who intend to prescribe FIT and colonoscopy in equal proportions and engage in SDM.

Methods

Study setting and participants

The canton of Vaud is in French-speaking Switzerland and has approximately 740,000 inhabitants, of whom 180,000 are between 50 and 70. A systematic, organized, statewide CRC screening program was launched in the canton in the fall of 2015, the first systematic CRC screening program in Switzerland. Eligible citizens receive an invitation letter and decision aid explaining the rationale for screening and the choice of FIT and colonoscopy. They are encouraged to visit their PCP, who can discuss screening and provide either a prescription for a FIT kit or referral for colonoscopy. The program comes after a federal decision in 2013 to have screening colonoscopy and FIT be reimbursed by base, obligatory insurance packages\cite{22}; in the setting of a screening program, an inclusion visit with their PCP, the screening test, and diagnostic colonoscopies after a positive FIT are all covered without deductible.

At the end of 2014, all PCPs registered to practice in the Canton Vaud were invited to participate in one of five seminars held in January and February 2015 for the new CRC screening program. The seminars were free of charge and offered Continuing Medical Education (CME) credits and free food. Those who had not been to one of these seminars were mailed an invitation at the end of February to an added session March 24, 2015, along with paper copies of the SDM materials described below, and a questionnaire regarding their CRC screening practices.

Seminars
The seminar lasted two hours. Multiple strategies were employed to achieve the educational objectives, including lectures, interactive elements and discussion, and the use of SDM tools (supplementary figure 1). The lectures summarized the epidemiology of CRC screening, follow-up of polyps and the organization of the screening program, and integrated interactive elements. First, we presented the variation among attending PCPs regarding their preferred screening modality (FIT vs colonoscopy) by using live polling (TurningPoint® technology), along with other knowledge-based multiple choice questions. Second, we used a narrative presenting a patient choosing a FIT test and naming her reasons for choosing FIT rather than colonoscopy in an 8-minute video of an ideal inclusion visit at the PCP office. Third, the video presented a role model of a physician actively going through the process of SDM like the choice talk, option talk, decision talk and teach-back. Finally, we used elements of risk communication to facilitate the understanding of PCPs of the pros and cons of screening. Communication materials were presented during the session and in context using the video; these included an evidence summary for PCPs (“Decision Box”) based on work of Giguere et al and a decision aid based on current recommendations such as the use of multiple methods to present risk in natural frequencies using text, figures as well as a summary table (supplementary materials).

Questionnaires

We used two paired anonymized questionnaires for the PCPs participating in the seminar, before and after the seminar. The questionnaires contained a total of 16 questions querying demographics (sex, age, practice characteristics, and personal CRC screening history), screening modalities offered to their patients, preferred communication style and a knowledge question about the appropriate indication for screening (see primary and secondary outcomes section below). We used a similar questionnaire for PCPs not participating, adapting the questions in a single questionnaire. PCPs not participating to the training had the opportunity to fill the questionnaire on paper or using an identical questionnaire online using the program Survey Monkey®.

Primary and secondary outcomes

We aligned our outcomes with our objectives (supplementary figure 1). The primary outcome was the increase in the proportion of PCPs answering that they intended to prescribe FIT and colonoscopy in close to equal proportions. PCPs
were asked before the seminar “During recent months, if you prescribed a CRC screening test, to what proportion of your patients did you prescribe each of these tests”. Participants filled the percent of each option they currently prescribed on average (colonoscopy, FIT, FOBT, sigmoidoscopy, CT-scan, blood test, other method) and to arrive to 100% as a sum of the percentages. PCPs reporting that they offered colonoscopy and FIT between 40 and 60% of the time were considered to have offered the two tests in equal proportions. Both guaiac and immunological tests were considered as being a fecal occult blood test, and are referred here in the results as FIT testing. At the end of the session, participants were asked: “After the start of the screening program, to what proportion of your patients do you intend on prescribing each of these tests”. We aimed at capturing the variation in screening patterns between attending PCPs and the extent to which the program altered these screening patterns. Several studies suggest that nearly equal proportions of patients prefer non-invasive to invasive modes of CRC screening\textsuperscript{19,30,31}.

There were two secondary outcomes. First, we aimed at capturing if the seminar was associated with a change in preferred communication style from paternalistic to informed decision making\textsuperscript{32}. Before the session, we asked PCPs attending: “how are decisions made regarding CRC screening in your practice”; four answer possible were: “I take decisions myself according to my understanding of the risks and benefits of screening”, “I take the decision myself with strong consideration of the patient’s opinion”, “I take the decision with the patient on an equal basis” and “The patient takes the decision according to his/her understanding of the risks and benefits of screening”. This same question was asked to PCPs not attending. At the end of the session, PCPs attending were queried how they intended to approach decision making after the start of the screening program using a similar adapted question. The second secondary outcome was the proportion correctly answering that an asymptomatic 54-year-old woman without a family history of CRC meets inclusion criteria for screening. Here again, PCP answers after the seminar were compared to the same PCPs before the training and non-participants.

**Statistical analyses**

All questionnaires were completed by the physicians themselves and answers were extracted by one research assistant. Descriptive statistics were used for demographic characteristics. Chi-squared and t-test statistics were used to compare participant answers before and after the seminar, and between participants and non-participants. Logistic regression
was used to identify predictors of changing screening behaviours among participants. Univariate analyses were first used based on participant sex, diploma year, practice location and whether they attended the seminar. As only attending the seminar was significant <0.1, the primary analysis was univariate. A sensitivity analysis was performed using a model with all of the variables. All analyses were performed using STATA version 14 (StataCorp, College Station, Texas, USA).

Results with a two-sided p<0.05 were considered statistically significant.

Results

Of the 592 PCPs registered to practice in the Canton Vaud invited to participate, 133 (22%) attended one of five seminars (Figure 1), of whom 106 (80%) completed both the before and after questionnaires. 109 of 459 (24%) of PCPs who had not participated in a seminar returned a questionnaire (Table 1). Seminar participants were more likely to be female, have completed their professional diploma more recently, and be in practice with at least one other PCP.

Figure 2 shows the number of PCPs prescribing FIT and colonoscopy in equal proportions at baseline and their intended prescribing after the implementation of the systematic screening program. Among those who participated in the seminar, the proportion of PCPs to prescribe FIT and colonoscopy in equal proportions increased from 9% to 36%, an absolute difference 27% (RR: 4.2, 95%CI: 2.1-8.7, P=<0.001). We found no change between past and intended future prescribing among non-participants (13% to 14%) and found a significant difference in intended future prescribing among participants and non-participants (36% vs 14%, p=0.005). We found a significant decrease in the number of PCPs offering only colonoscopy among attendees while we found an increase among non-attendees (supplementary figures 2 and 3). Results from univariate models showed that only attendance to the course was significantly associated with a change in prescribing (OR 5.42, 95%CI: 2.2-13.3), while sex, year of diploma and practice location were not significant <0.1. In sensitivity analyses we included all of the variables in a multivariate model, and attending the course remained significant.

The proportion of physicians reporting that they take decisions regarding CRC together with their patients on an equal basis did not differ between attendees and non-attendees and did not change after the screening program (Figure 3A).

The proportion of physicians correctly responding that a 54-year-old asymptomatic woman without risk factors is a
candidate for CRC screening increased from 88% to 99% among those who attended the course (p=0.05), while there was no difference in baseline knowledge among those who did and did not attend the course (Figure 3B).

Discussion

We found a significant increase in the percentage of PCPs intending to prescribe FIT and colonoscopy in equal proportions before and after a seminar focused on increasing knowledge, teaching skills and changing attitudes on CRC screening. We did not find such a difference among PCPs who received paper training materials by mail but did not attend the seminar. The seminar was not associated with a self-reported change in SDM communication style and increased the percentage of PCPs correctly answering a clinical vignette on the indications for CRC screening.

While SDM has frequently been invoked as a way to decrease unwarranted variations in care\textsuperscript{13,33,34}, there is little literature about whether the implementation of SDM in physician training programs can have an impact on variations in care. The use of patient decision aids alone appears to improve patient decision making and decrease the use of certain invasive interventions\textsuperscript{35}, but a recent systematic review concluded that the implementation of SDM in daily practice is most effective when both patients and physicians are targeted\textsuperscript{36}. Several previous programs have shown that physician training in SDM can have an impact on the prescription patterns of PCPs in the setting of overuse of certain preference sensitive conditions, such as antibiotic prescription\textsuperscript{37} and prostate cancer screening\textsuperscript{38}. Our study adds to the literature by providing an example encouraging SDM in the context of CRC screening, an effective intervention where SDM might actually increase uptake\textsuperscript{19,21,35}.

The increase in the percentage of PCPs offering FIT and colonoscopy in equal proportions after the seminar was primarily due to an intention to increase FIT prescribing and a decrease in those providing only colonoscopy (supplementary figure 2). The baseline preference in both attendees and non-attendees was for colonoscopy, with about 20% in both groups reporting that colonoscopy was the only screening modality they had prescribed over the last 6 months, supporting reports that colonoscopy is becoming the leading screening modality in Switzerland\textsuperscript{16}. There was an increase in PCPs prescribing only colonoscopy among non-attendees, possibly because the screening program will provide reimbursement without a deductible. Research has shown that despite guidelines advocating a choice of CRC
screening methods, physicians tend to offer only one screening modality, which is most often colonoscopy. Unfortunately, failure to offer a choice might decrease screening rates.

While we saw an increase in the number of PCPs intending to prescribe FIT and colonoscopy in equal proportions, there was no change in the reported decision-making style. PCPs generally have a positive overall view of SDM but don’t find it appropriate to integrate all elements into every preference-sensitive decision. A previous randomized trial of a SDM training program found that PCP-reported decision making style did not change, but patients reported greater involvement in decision making and were less likely to receive antibiotics for respiratory tract infections. Another trial led to a change in PCP behaviours related to prostate cancer screening without any change specific metrics of SDM. An increase in PCP-reported decision making style may not be a necessary mediator of the desired behavior change, which is the incorporation of patient preferences.

Our seminar was a multifaceted intervention with lectures, interactivity and discussion and distribution of SDM tools (supplementary figure 1), building on literature that the use of learning methods only such as passive lectures only is insufficient to change physician behavior. Our objectives were located in the three main domains frequently targeted in medical education, specifically knowledge, skills and attitudes. Attitude change was considered especially important, and was targeted using the presentation of variation in prescribing habits within the assembly, a movie with the narrative of a person choosing FIT and role modeling in the video showing a physician during an ideal SDM encounter.

Future interventions to reinforce physician behaviour could include evidence-based interventions such as reminders, academic detailing and provider feedback. The increase in the intention to prescribe both FIT and colonoscopy could be because PCPs felt more competent in offering a choice of screening modalities. While competence in health promotion and disease prevention is well-known in medical competency frameworks, the specific inclusion of SDM could bring an added dimension in this area.

Limitations

Our findings are mostly limited by the fact that the participants were not randomized to attend the training program. While we compared the screening intentions of PCPs not attending the training seminar, we found differences in the
baseline demographics of attendees and non-attendees. Beyond these demographic differences, there might be other important differences between participants and non-participants which limit causal inference from our program. The demographic make-up of the non-attendees is likely more representative of Swiss primary care\textsuperscript{46}. However, the baseline views and practice patterns of the two groups were similar, suggesting that our seminar may be able to produce similar results with other Swiss PCPs. Moreover, the similarity between the baseline views of training attendees and the lack of change in the views of non-attendees suggest that outside secular trends such as increased awareness of CRC screening were less important.

Our outcomes are based on the intention of PCPs to prescribe both screening modalities roughly equally and do not represent actual physician prescribing practices. Further, we surveyed participants directly before and after the seminar, and it is unclear whether these intentions will be sustained after the return to routine practice where there are oftentimes multiple barriers to SDM\textsuperscript{47}. However, other studies have shown that even short educational interventions incorporating films and decision tools can significantly alter the behavior of PCPs\textsuperscript{37}. Future studies will need to compare practice patterns in a carefully performed randomized controlled trial (RCT) and over a significant follow-up before we can infer a causal effect of the training program on reducing variation in care. Also, the seminar was performed by a single team in one state, which may make it more difficult to implement elsewhere.

Conclusions

An educational intervention focused on SDM in CRC screening appears to have increased the percentage of PCPs intending to prescribe FIT and colonoscopy in equal proportions. This change might decrease variations in care by decreasing the emphasis on physician preferences for one screening modality over another and placing the emphasis on patient preferences. Future studies should test the effect of the intervention within a carefully performed RCT with adequate follow-up and measuring a change in practice to determine whether the change in intended use of FIT and colonoscopy are reflected in practice.

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Author contributions: All authors helped design the training program. KS, JC, JB, CN, GD, CD and RA helped give the training seminars. KS, JC and RA designed and tested the questionnaires. KS and RA collected and analysed the data and...
wrote the first draft of the paper. All the authors undertook revisions, contributed intellectually to the development of this paper and approved the final manuscript.

Competing interests: The authors have no potential conflicts of interest to disclose.

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Data sharing statement: Primary data and unpublished data are available upon request.
References


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40. Smith WR. Evidence for the effectiveness of techniques To change physician behavior. Chest 2000;118:8S-17S.
Figures

Figure 1: Flow of study participants

Figure 2: Proportion of physicians prescribing stool-based testing and colonoscopy in equal proportions at baseline and intended future prescribing, stratified by those attending and not attending the training seminar.

Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the training seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the training seminar.
Table 1: Characteristics of primary care physician participants and non-participants in the seminars

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<th>Non-participants (n=109)</th>
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<td>Women (%)</td>
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<td>Age less than 50 (%)</td>
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<td>Practice location</td>
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<td>Missing</td>
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<td>Have already themselves undergone CRC screening</td>
<td>50 (51%)</td>
<td>58 (53%)</td>
<td>0.696</td>
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<td>Screening, for those who have undergone screening</td>
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<td>Colonoscopy</td>
<td>37 (74%)</td>
<td>55 (95%)</td>
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<tr>
<td>Stool-based test</td>
<td>8 (16%)</td>
<td>2 (3%)</td>
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<td>Baseline prescribing by screening modality</td>
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<tr>
<td>&gt;60% colonoscopy</td>
<td>64 (68%)</td>
<td>61 (56%)</td>
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<tr>
<td>&gt;60% FIT/gFOBT</td>
<td>19 (20%)</td>
<td>17 (16%)</td>
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<td>Equal stool-based and colonoscopy</td>
<td>8 (9%)</td>
<td>14 (13%)</td>
<td>0.311</td>
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FIT: Fecal immunochemical test, FOBT: guaiac fecal occult blood test

# Of those who have undergone CRC screening, 88% have had colonoscopy and 10% a stool-based test.
Figure 1: Flow of study participants

592 primary care physicians (PCPs) mailed invitation to participate in training seminar

133 (22%) attended seminar
106 (80%) completed questionnaires before and after seminar

459 (78%) did not attend seminar and received a mail questionnaire
100 (24%) completed questionnaire
Figure 2: Proportion of physicians prescribing stool-based testing and colonoscopy in equal proportions at baseline and intended future prescribing with the cantonal screening program, stratified by those attending and not attending the seminar.

![Proportion of physicians prescribing stool-based testing and colonoscopy](image)
Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the seminar.
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Online-only supplementary materials

Supplementary figure 1: Overview of the educational intervention.......................................................p. 2
Supplementary figures 2 and 3: Detailed results of change in screening behaviours...........................p. 3
Web links to program materials.............................................................................................................p. 4
Supplementary figure 1: Overview of educational intervention

**Educational intervention for primary care physicians (PCPs) participating in a colorectal cancer (CRC) screening program**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Interventions</th>
<th>Outcomes</th>
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<tr>
<td>1. <strong>Knowledge:</strong></td>
<td>1. Lecture:</td>
<td>Primary: Intention to prescribe FIT and colonoscopy in close to equal proportions.</td>
</tr>
<tr>
<td>- Functioning of program.</td>
<td>- Organisational aspects.</td>
<td>Secondary: Communication style that reflects SDM.</td>
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<tr>
<td>- Epidemiology of CRC and polyp follow-up</td>
<td>- Screening indications and follow-up.</td>
<td>Secondary: Correct answer for screening indication in a patient scenario.</td>
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<td>- Presentation of screening modalities.</td>
<td>- Performance of each screening test.</td>
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<tr>
<td>2. <strong>Skills and tools needed for shared decision making (SDM).</strong></td>
<td>2. Interactivity and discussion:</td>
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<tr>
<td>3. Change in <strong>attitudes:</strong> importance of offering choice and incorporating preferences</td>
<td>- Multiple choice questions with live answers.</td>
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<td></td>
<td>- Demonstrating variation between peers.</td>
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<td></td>
<td>- Video of SDM consultation offering the choice.</td>
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<td></td>
<td>- Risk communication techniques.</td>
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<td>3. SDM tools:</td>
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<td></td>
<td>- Decision aid.</td>
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<td></td>
<td>- Images for consultation.</td>
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<tr>
<td></td>
<td>- Evidence summary</td>
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Supplementary figure 2: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for attendees of the training program (n=106). Using the Wilcoxon test for change between the groups gives z = -3.41 (p<=0.001).

Supplementary figure 3: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for non-attendees of the training program (n=109). Using the Wilcoxon test for change between the groups gives z = 3.30 (p=0.001).
Web links to program materials openly available online at the website for the Policlinique médicale universitaire de Lausanne:

Decision aid mailed to patients when invited to the cantonal program (20 pages):

Decision box to prepare primary care physicians (2 pages):

Decision board to use during primary care physician consultations (3 pages)

Online link to a shared decision making consultation:
https://m.pmu-lausanne.ch/sites/default/files/pmu_consultation_colon_0_0.webm

Video of the first training session:
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| 1 | (a) Indicate the study’s design with a commonly used term in the title or the abstract
(b) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | 
| 2 | Explain the scientific background and rationale for the investigation being reported |
| **Objectives** | 
| 3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | 
| 4 | Present key elements of study design early in the paper |
| 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| 6 | (a) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up
*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls
*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants |
| (b) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed
*Case-control study*—For matched studies, give matching criteria and the number of controls per case |
| 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| 8 | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| 9 | Describe any efforts to address potential sources of bias |
| 10 | Explain how the study size was arrived at |
| 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| 12 | (a) Describe all statistical methods, including those used to control for confounding
(b) Describe any methods used to examine subgroups and interactions
(c) Explain how missing data were addressed
(d) *Cohort study*—If applicable, explain how loss to follow-up was addressed
*Case-control study*—If applicable, explain how matching of cases and controls was addressed
*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
(e) Describe any sensitivity analyses |

Continued on next page
Results

Participants 13* (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed ✓ p. 8
(b) Give reasons for non-participation at each stage x not available.
(c) Consider use of a flow diagram ✓ Figure 1, p. 8

Descriptive data 14* (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders ✓ Table 1, p. 16.
(b) Indicate number of participants with missing data for each variable of interest ✓ Table 1, p. 16.
(c) Cohort study—Summarise follow-up time (eg, average and total amount) n/a.

Outcome data 15* Cohort study—Report numbers of outcome events or summary measures over time ✓ p. 8 + Figure 2.
Case-control study—Report numbers in each exposure category, or summary measures of exposure
Cross-sectional study—Report numbers of outcome events or summary measures

Main results 16 (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included ✓ p. 8 + Figure 2, p. 18.
(b) Report category boundaries when continuous variables were categorized ✓ Table 1, p. 16.
(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period n/a.

Other analyses 17 Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses ✓ Figure 3, p. 19 and supporting materials.

Discussion

Key results 18 Summarise key results with reference to study objectives ✓ p. 9.

Limitations 19 Discuss limitations of the study, taking into account sources of potential bias or imprecision.
Discuss both direction and magnitude of any potential bias ✓ p. 10.

Interpretation 20 Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence ✓ p. 10.

Generalisability 21 Discuss the generalisability (external validity) of the study results ✓ p. 10.

Other information

Funding 22 Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based ✓ p. 12.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

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| Complete List of Authors: | Selby, Kevin; University of Lausanne, Department of Ambulatory Care and Community Medicine  
|                     | Cornuz, Jacques; University of Lausanne, Department of Ambulatory Care and Community Medicine  
|                     | Gachoud, David; Centre hospitalier universitaire vaudois Departement de medecine; University of Lausanne, Faculty of Biology and Medicine, Education Unit  
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|                     | Auer, Reto; University of Lausanne, Department of Ambulatory Care and Community Medicine  |
| <b>Primary Subject Heading</b>: | Patient-centred medicine |
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Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

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Original research article

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1 Table and 3 Figures

46 references

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Abstract:

Objectives: Primary care physicians (PCPs) should prescribe fecal immunochemical testing (FIT) or colonoscopy for colorectal cancer screening based on their patient’s values and preferences. However, there are wide variations between PCPs in the screening method prescribed. The objective was to assess the impact of an educational intervention on PCPs’ intent to offer FIT or colonoscopy on an equal basis.

Design: Survey before and after training seminars with a parallel comparison through a mailed survey to PCPs not attending the training seminars.

Setting: All PCPs in the canton of Vaud, Switzerland

Participants: Of 592 eligible PCPs, 133 (22%) attended a seminar, of which 106 (80%) filled both surveys. 109 (24%) PCPs who did not attend the seminars returned the mailed survey.

Intervention: A 2-hour-long interactive seminar targeting PCP knowledge, skills and attitudes regarding offering a choice of CRC screening options.

Outcome measures: The primary outcome was PCP intention of having their patients screened with FIT and colonoscopy in equal proportions (between 40 and 60% each). Secondary outcomes were the perceived role of PCPs in screening decisions (from paternalistic- to informed- decision making) and correct answer to a clinical vignette.

Results: Before the seminars, 8% of PCPs reported that they had equal proportions of their patients screened for CRC by FIT and colonoscopy; after the seminar, 33% foresaw having their patients screened in equal proportions (absolute difference 25%, p<0.001). Among those not attending, there was no change (13% vs 14%, p=0.8). Of those attending, there was no change in their perceived role in screening decisions, while the proportion responding correctly to a clinical vignette increased (88% to 99%, p<0.001).

Conclusions: An interactive training seminar increased the proportion of physicians with the intention to prescribe FIT and colonoscopy in equal proportions.

Abstract word count: 287 words (300 max)
Strengths and limitations of this study:

- The training seminars were organized within the implementation of a statewide organized screening program.

- All primary care physicians in canton Vaud, Switzerland were invited to attend the seminars. All those not attending were mailed a survey.

- Twenty two percent of PCPs attended the seminars and 24% not attending returned the mail survey; there was no randomization of PCPs to the intervention, limiting causal inference.

- We only measured changes in intentions to prescribe and verified prescription rates are needed.
Introduction

Screening for colorectal cancer (CRC) reduces CRC mortality and is widely recommended beginning at age 50\(^1\,^2\). The recommended methods for CRC screening each have varying test characteristics\(^3\); while colonoscopy has high sensitivity for both cancerous and pre-cancerous lesions, allowing screening every 10 years, it is invasive and carries a risk of bleeding\(^4\). Fecal immunochemical testing (FIT) for occult blood on the other hand has lower sensitivity for pre-cancerous adenomas, but is less costly, can be performed at home without preparation, and has higher acceptability than colonoscopy\(^5\,\,^7\). Studies have suggested that in real-world settings the performance of FIT and colonoscopy for detecting cancers are equivalent, making both reasonable first-line choices for screening\(^6\,\,^8\).

In contexts where more than one reasonable choice exists, preferences become important\(^9\). Some patients might prefer colonoscopy, thereby accepting a more burdensome screening modality than FIT, while others might prefer FIT, accepting its reduced precision as compared to colonoscopy. Physicians, especially in the United States, have a clear preference for colonoscopy because of its greater sensitivity for and ability to remove pre-cancerous adenomas and polyps\(^10\). Extensive literature has revealed wide geographic variations in the use of preference-sensitive conditions, including CRC screening method\(^11\), that are not explained by differences in patient preferences, but rather by physician preferences and local medical culture\(^12\). These differences persist when looking at the level of individual physicians, not just geographic areas\(^13\). Shared decision making (SDM) might help reduce these unacceptable variations by increasing patient participation in decisions\(^13\,\,14\). Patients’ preferences towards a screening modality are expected to vary between patients within primary care practice\(^7\). Training physicians to identify their patients’ preferences might lead physicians who essentially prescribe their own preferred screening method to prescribe the screening method preferred by their patients and thereby increase the variation of prescribed screening modality within their practice. Reducing the number of physicians who only prescribe one screening modality through preference diagnosis will in turn lead to reduced variation between practices\(^9\).

The Health Department of the canton of Vaud has recently decided to launch the first systematic, statewide, organized CRC screening program in Switzerland that will offer both FIT and colonoscopy to the entire eligible population via a...
discussion with their primary care physician (PCP)\textsuperscript{15}. The aims of the discussion with their PCP are to increase the number of citizens who take an active decision about CRC screening and enable participants to choose between two screening methods within a SDM encounter with their PCP\textsuperscript{15}. A decision aid will be mailed informing citizens of the program, the available screening modalities, and encourage discussion with their PCP. Baseline surveys of PCPs in the canton suggest wide variations in baseline PCP preferences, with a predilection for colonoscopy\textsuperscript{15}. International literature suggests that physician preference for colonoscopy translates into recommendations to patients focused on colonoscopy alone, with little mention of other screening modalities\textsuperscript{10,16}; this could have negative effects on patient participation and independence\textsuperscript{7,10,17,18}. SDM should contribute to reducing variation in care between individual practices.

We administered training seminars for PCPs from the Canton of Vaud prior to the beginning of the screening program. The objectives of the seminar were to improve PCPs knowledge, provide skills and tools needed for SDM with patients, and change the attitudes of PCPs regarding the importance of incorporating patient preferences in CRC screening decisions (supplementary figure 1). We hypothesized that such an intervention would increase the number of PCPs who intend to prescribe FIT and colonoscopy in equal proportions and engage in SDM.

**Methods**

**Study setting and participants**

The canton of Vaud is in French-speaking Switzerland and has approximately 740,000 inhabitants, of whom 180,000 are between 50 and 69. A systematic, organized, statewide CRC screening program was launched in the canton in the fall of 2015, the first systematic CRC screening program in Switzerland. Eligible citizens will receive an invitation letter and decision aid explaining the rationale for screening and the choice of FIT and colonoscopy. They are encouraged to visit their PCP, who can discuss screening and provide either a prescription for a FIT kit or referral for colonoscopy. The program comes after a federal decision in 2013 to have screening colonoscopy and FIT be reimbursed by base, obligatory insurance packages\textsuperscript{19}; in the setting of a screening program, an inclusion visit with their PCP, the screening test, and diagnostic colonoscopies after a positive FIT are all covered without deductible.
At the end of 2014, all PCPs registered to practice in the Canton Vaud were invited to participate in one of five seminars held in January and February 2015 for the new CRC screening program. The seminars were free of charge and offered Continuing Medical Education (CME) credits and free food. Those who had not been to one of these seminars were mailed an invitation at the end of February to an added session March 24, 2015, along with paper copies of the SDM materials described below, and a questionnaire regarding their CRC screening practices. Ethical approval was not required as we only collected anonymized data through questionnaires from physicians participating in training session and practicing family physicians in the community, as specified by the Swiss Federal Office of Public Health.

**Seminars**

The seminar lasted two hours. Multiple strategies were employed to achieve the educational objectives, including lectures, interactive elements and discussion, and the use of SDM tools (supplementary figure 1). The lectures summarized the epidemiology of CRC screening, follow-up of polyps and the organization of the screening program, and integrated interactive elements. First, we presented the variation among attending PCPs regarding their preferred screening modality (FIT vs colonoscopy) by using live polling (TurningPoint® technology), along with other knowledge-based multiple choice questions. Second, we used a narrative presenting a patient choosing a FIT test and naming her reasons for choosing FIT rather than colonoscopy in an 8-minute video of an ideal inclusion visit at the PCP office. Third, the video presented a role model of a physician actively going through the process of SDM; we used the suggested framework of Elwyn et al with three stages of SDM (choice talk, option talk, and decision talk), which is meant to allow information sharing by the physician and a safe space for patients to express their preferences. This process was followed by teach-back (having patients repeat back important information), which has been shown to improve retention, especially by patients with low health literacy. Finally, we used elements of risk communication to facilitate the understanding of PCPs of the pros and cons of screening. Communication materials were presented during the session and in context using the video; these included an evidence summary for PCPs (“Decision Box”) based on work of Giguere et al and a decision aid based on current recommendations such as the use of multiple methods to present risk in natural frequencies using text, figures as well as a summary table (supplementary materials).

**Questionnaires**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml
We used two paired anonymized questionnaires for the PCPs participating in the seminar, before and after the seminar. The questionnaires contained a total of 16 questions querying demographics (sex, age, practice characteristics, and personal CRC screening history), screening modalities offered to their patients, preferred communication style and a knowledge question about the appropriate indication for screening (see primary and secondary outcomes section below). We used a similar questionnaire for PCPs not participating, adapting the questions in a single questionnaire. PCPs not participating to the training had the opportunity to fill the questionnaire on paper or using an identical questionnaire online using the program Survey Monkey®.

**Primary and secondary outcomes**

We aligned our outcomes with our objectives (supplementary figure 1). The primary outcome was the increase in the proportion of PCPs answering that they intended to prescribe FIT and colonoscopy in close to equal proportions. PCPs were asked before the seminar “During recent months, if you prescribed a CRC screening test, to what proportion of your patients did you prescribe each of these tests?”. Attendees filled the percent of each option they currently prescribed on average (colonoscopy, FIT, FOBT, sigmoidoscopy, CT-scan, blood test, other method) and were supposed to arrive at 100% as a sum of the percentages. PCPs reporting that they offered colonoscopy and FIT between 40 and 60% of the time were considered to have offered the two tests in equal proportions. Both guaiac and immunological tests were considered as being a fecal occult blood test, and are referred here in the results as FIT testing, as FIT is the testing modality used by the new screening program. At the end of the session, attendees were asked: “After the start of the screening program, to what proportion of your patients do you intend on prescribing each of these tests?”. We aimed at capturing the variation in screening patterns between attending PCPs and the extent to which the program altered these screening patterns. Several studies suggest that nearly equal proportions of patients prefer non-invasive to invasive modes of CRC screening7,28,29.

There were two secondary outcomes. First, we aimed at capturing if the seminar was associated with a change in preferred communication style from paternalistic to informed decision making30. Before the session, we asked PCPs attending: “how are decisions made regarding CRC screening in your practice?”; four answer possible were: “I take decisions myself according to my understanding of the risks and benefits of screening”, “I take the decision myself with...”
strong consideration of the patient’s opinion”, “I take the decision with the patient on an equal basis” and “The patient takes the decision according to his/her understanding of the risks and benefits of screening”. This same question was asked to PCPs not attending. At the end of the session, PCPs attending were queried how they intended to approach decision making after the start of the screening program using a similar adapted question. The second secondary outcome was the proportion correctly answering that an asymptomatic 54-year-old woman without a family history of CRC meets inclusion criteria for screening. Here again, PCP answers after the seminar were compared to the same PCPs before the training and non-attendees.

**Statistical analyses**

All questionnaires were completed by the physicians themselves and answers were extracted by one research assistant. Descriptive statistics were used for demographic characteristics. Chi-squared and t-test statistics were used to compare physician characteristics and responses between attendees and non-attendees. McNemar’s test for paired data was used to compare answers from attendees before and after the seminar. Logistic regressions were used to identify predictors of a change in screening behaviours; we used generalized estimating equations (GEE) logistic regressions with an exchangeable correlation structure to take into account clustering of the data by participant. We first ran univariate logistic regressions with the change in screening behaviour as a binary outcome and participant’s sex, diploma year, practice location and whether they attended the seminar as predictors. As only attending the seminar was significant with p<0.1 in univariate analyses, the primary analysis was univariate. A sensitivity analysis was performed using a model with all of the variables. All analyses were performed using STATA version 14 (StataCorp, College Station, Texas, USA). Results with a two-sided p<0.05 were considered statistically significant.

**Results**

Of the 592 PCPs registered to practice in the Canton Vaud invited to participate, 133 (22%) attended one of five seminars (Figure 1), of whom 106 (80%) completed both the before and after questionnaires. 109 of 459 (24%) of PCPs who had not participated in a seminar returned a questionnaire (Table 1). Seminar attendees were more likely to be female, have completed their professional diploma more recently, and be in practice with at least one other PCP.
Figure 2 shows the number of PCPs prescribing FIT and colonoscopy in equal proportions at baseline and their intended prescribing after the implementation of the systematic screening program. Among those who participated in the seminar, the proportion of PCPs to prescribe FIT and colonoscopy in equal proportions increased from 8% to 33%, an absolute difference of 25% (RR: 4.1, 95%CI: 2.2-7.7, p<0.001). We found no change between past and intended future prescribing among non-attendees (13% to 14%, p=0.8) and found a significant difference in intended future prescribing among participants and non-participants (33% vs 14%, p<0.001). We found a significant decrease in the number of PCPs offering only colonoscopy among attendees while we found an increase among non-attendees (supplementary figures 2 and 3). Results from univariate models showed that only attendance to the course was significantly associated with a change in prescribing (OR 1.84, 95%CI: 1.01-3.37), while sex, year of diploma and practice location were not significant <0.1. In sensitivity analyses we included all of the variables in a multivariate model, and attending the course remained significant.

The proportion of physicians reporting that they take decisions regarding CRC together with their patients on an equal basis did not differ between attendees and non-attendees and did not change after the seminar (Figure 3A). The proportion of physicians correctly responding that a 54-year-old asymptomatic woman without risk factors is a candidate for CRC screening increased from 88% to 99% among those who attended the course (p<0.001), while there was no difference in baseline knowledge among those who did and did not attend the course (p=0.4) (Figure 3B).

Discussion

We found a significant increase in the percentage of PCPs intending to prescribe FIT and colonoscopy in equal proportions before and after a seminar focused on increasing knowledge, teaching skills and changing attitudes on CRC screening. We did not find such a difference among PCPs who received paper training materials by mail but did not attend the seminar. The seminar was not associated with a self-reported change in SDM communication style and increased the percentage of PCPs correctly answering a clinical vignette on the indications for CRC screening.

While SDM has frequently been invoked as a way to decrease unwarranted variations in care\textsuperscript{14,31,32}, there is little literature about whether the implementation of SDM in physician training programs can have an impact on variations in
care. The use of patient decision aids alone appears to improve patient decision making and decrease the use of certain invasive interventions\textsuperscript{33}, but a recent systematic review concluded that the implementation of SDM in daily practice is most effective when both patients and physicians are targeted\textsuperscript{34}. Several previous programs have shown that physician training in SDM can have an impact on the prescription patterns of PCPs in the setting of overuse of certain preference-sensitive conditions, such as antibiotic prescription\textsuperscript{35} and prostate cancer screening\textsuperscript{36}. Our study adds to the literature by providing an example encouraging SDM in the context of CRC screening, an effective intervention where SDM might actually increase uptake\textsuperscript{7,18,33}.

The increase in the percentage of PCPs offering FIT and colonoscopy in equal proportions after the seminar was primarily due to an intention to increase FIT prescribing and a decrease in those providing only colonoscopy (supplementary figure 2). The baseline preference in both attendees and non-attendees was for colonoscopy, with about 20% in both groups reporting that colonoscopy was the only screening modality they had prescribed over the last 6 months, supporting evidence that colonoscopy is becoming the leading screening modality in Switzerland\textsuperscript{37}. There was an increase in PCPs prescribing only colonoscopy among non-attendees, possibly because the screening program will provide reimbursement without a deductible. Research has shown that despite guidelines advocating a choice of CRC screening methods\textsuperscript{1}, physicians tend to offer only one screening modality, which is most often colonoscopy\textsuperscript{10}.

Unfortunately, failure to offer a choice might decrease screening rates\textsuperscript{7}.

While we saw an increase in the number of PCPs intending to prescribe FIT and colonoscopy in equal proportions, there was no change in the reported decision-making style. PCPs generally have a positive overall view of SDM but do not find it appropriate to integrate all elements into every preference-sensitive decision\textsuperscript{38}. A previous randomized trial of a SDM training program found that PCP-reported decision making style did not change, but patients reported greater involvement in decision making and were less likely to receive antibiotics for respiratory tract infections\textsuperscript{30}. Another trial led to a change in PCP behaviours related to prostate cancer screening without any change specific metrics of SDM\textsuperscript{36}. It may not be necessary to change a PCP’s reported decision making style in order for them to be more likely to offer the choice of FIT and colonoscopy to their patients.
Our seminar was a multifaceted intervention with lectures, interactivity and discussion and distribution of SDM tools (supplementary figure 1), building on literature that the use of learning methods such as passive lectures only is insufficient to change physician behavior. Our objectives were located in the three main domains frequently targeted in medical education, specifically knowledge, skills and attitudes. Attitude change was considered especially important, and was targeted using the presentation of variation in prescribing habits within the assembly, a movie with the narrative of a person choosing FIT and role modeling in the video showing a physician during an ideal SDM encounter.

Future interventions to reinforce physician behaviour could include evidence-based interventions such as reminders, academic detailing and provider feedback. The increase in the intention to prescribe both FIT and colonoscopy could be because PCPs felt more competent in offering a choice of screening modalities. Competence in health promotion and disease prevention is a required skill in several medical competency frameworks; specific training in SDM, as demonstrated in our program, could help ensure that physicians perform prevention activities in a way that respects individual patient values and preferences.

Limitations

Our findings are limited by the fact that the attendees were not randomized to attend the training program. While we compared the screening intentions of PCPs not attending the training seminar, we found differences in the baseline demographics of attendees and non-attendees. Beyond these demographic differences, there might be other important differences between attendees and non-attendees which limit causal inference from our program. The demographic make-up of the non-attendees is likely more representative of Swiss primary care. However the response rate among non-responders was low, which limits inferences on the larger population of PCPs in the canton. Data from the two groups were also collected in different circumstances; for the intervention group it was before and after a seminar, while for the comparison group each PCP received the questionnaire through the mail or electronically and we have no information on the time, location and circumstances when the questionnaires were filled. However, the baseline views and practice patterns of the two groups were similar, suggesting that our seminar may be able to produce similar results with other Swiss PCPs. Moreover, the similarity between the baseline views of training attendees and the lack of change...
in the views of non-attendees suggest that outside secular trends such as increased awareness of CRC screening were
less important.

Our outcomes are based on the intention of PCPs to prescribe both screening modalities roughly equally and do not
represent actual physician prescribing practices. Further, we surveyed attendees directly before and after the seminar,
and it is unclear whether these intentions will be sustained after the return to routine practice where there are often
multiple barriers to SDM. However, other studies have shown that even short educational interventions incorporating
films and decision tools can significantly alter the behavior of PCPs. Future studies will need to compare practice
patterns in a carefully performed randomized controlled trial (RCT) and over a significant follow-up before we can infer a
causal effect of the training program on reducing variation in care. Also, the seminar was performed by a single
multidisciplinary team in one state, which may make it more difficult to implement elsewhere.

Conclusions

An educational intervention focused on SDM in CRC screening appears to have increased the percentage of PCPs
intending to prescribe FIT and colonoscopy in equal proportions. This change might decrease variations in care by
decreasing the emphasis on physician preferences for one screening modality over another and placing the emphasis on
patient preferences. Future studies should test the effect of the intervention within a carefully performed RCT with
adequate follow-up and measuring a change in practice to determine whether the change in intended use of FIT and
colonoscopy are reflected in practice.

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Author contributions: All authors helped design the training program. KS, JC, JLB, CN, GD, CD and RA helped give the
training seminars. KS and RA designed and tested the questionnaires. KS and RA collected and analysed the data and
wrote the first draft of the paper. All the authors undertook revisions, contributed intellectually to the development of
this paper and approved the final manuscript.

Competing interests: The authors have no potential conflicts of interest to disclose.

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profit sectors.

Data sharing statement: Primary data and unpublished data are available upon request.
References

39. Smith WR. Evidence for the effectiveness of techniques To change physician behavior. Chest 2000;118:8S-17S.
Figures

Figure 1: Flow of study participants

Figure 2: Proportion of physicians prescribing stool-based testing and colonoscopy in equal proportions at baseline and intended future prescribing, stratified by those attending and not attending the training seminar.

Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the training seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the training seminar.
Table 1: Characteristics of primary care physician attendees and non-attendees in the seminars

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<td>91 (88%)</td>
<td>80 (83%)</td>
<td>0.384</td>
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<tr>
<td>Rural</td>
<td>12 (12%)</td>
<td>16 (17%)</td>
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<tr>
<td><strong>Weekly work schedule</strong></td>
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<tr>
<td>Fewer than 10 half-days per week</td>
<td>7 (7%)</td>
<td>34 (31%)</td>
<td>0.256</td>
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<tr>
<td>10 or more half-days per week</td>
<td>26 (25%)</td>
<td>74 (69%)</td>
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<tr>
<td>Missing</td>
<td>73 (69%)</td>
<td>1 (1%)</td>
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<tr>
<td><strong>Have already themselves undergone CRC</strong></td>
<td></td>
<td></td>
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<tr>
<td>screening</td>
<td>50 (51%)</td>
<td>58 (53%)</td>
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<tr>
<td><strong>Screening test, for those who have undergone screening</strong></td>
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<tr>
<td>Colonoscopy</td>
<td>37 (74%)</td>
<td>55 (95%)</td>
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<tr>
<td>Stool-based test</td>
<td>8 (16%)</td>
<td>2 (3%)</td>
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<tr>
<td><strong>Baseline prescribing by screening modality</strong></td>
<td></td>
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<tr>
<td>&gt;60% colonoscopy</td>
<td>64 (68%)</td>
<td>61 (56%)</td>
<td></td>
</tr>
<tr>
<td>&gt;60% FIT/gFOBT</td>
<td>19 (20%)</td>
<td>17 (16%)</td>
<td></td>
</tr>
<tr>
<td>Equal stool-based and colonoscopy</td>
<td>8 (9%)</td>
<td>14 (13%)</td>
<td>0.311</td>
</tr>
</tbody>
</table>

FIT: Fecal immunochemical test, FOBT: guaiac fecal occult blood test

# Of those who have undergone CRC screening, 88% have had colonoscopy and 10% a stool-based test.
Figure 1: Flow of study participants

592 primary care physicians (PCPs) mailed invitation to participate in training seminar

133 (22%) attended seminar

106 (80%) completed questionnaires before and after seminar

459 (78%) did not attend seminar and received a mail questionnaire

100 (24%) completed questionnaire
Figure 2: Physicians prescribing stool-based testing and colonoscopy in similar proportions at baseline and intended future prescribing with the cantonal screening program, stratified by those attending and not attending the seminar.

![Graph showing the comparison between attendees and non-attendees in terms of prescription of stool-based testing and colonoscopy with and without the screening program. The graph includes percentages and statistical significance for baseline and with screening program conditions.]
Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the seminar.
592 primary care physicians (PCPs) mailed invitation to participate in training seminar

133 (22%) attended seminar

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Figure 1: Flow of study participants
180x150mm (300 x 300 DPI)
Figure 2: Physicians prescribing stool-based testing and colonoscopy in similar proportions at baseline and intended future prescribing with the cantonal screening program, stratified by those attending and not attending the seminar.

217x150mm (300 x 300 DPI)
Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the seminar.
Selby et al. An educational intervention to encourage the equal offer of fecal occult blood testing and colonoscopy for colorectal cancer screening

Online-only supplementary materials

Supplementary figure 1: Overview of the educational intervention.......................................................p. 2
Supplementary figures 2 and 3: Detailed results of change in screening behaviours...........................p. 3
Web links to program materials.............................................................................................................p. 4
Supplementary figure 1: Overview of educational intervention

**Educational intervention for primary care physicians (PCPs) participating in a colorectal cancer (CRC) screening program**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Interventions</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| 1. Knowledge:  
- Functioning of program.  
- Epidemiology of CRC and polyp follow-up  
- Presentation of screening modalities. | 1. Lecture:  
- Organisational aspects.  
- Screening indications and follow-up.  
- Performance of each screening test. | Primary: Intention to prescribe FIT and colonoscopy in close to equal proportions. |
| 2. Skills and tools needed for shared decision making (SDM). | 2. Interactivity and discussion:  
- Multiple choice questions with live answers.  
- Demonstrating variation between peers.  
- Video of SDM consultation offering the choice.  
- Risk communication techniques. | Secondary: Communication style that reflects SDM. |
| 3. Change in attitudes: importance of offering choice and incorporating preferences | 3. SDM tools:  
- Decision aid.  
- Images for consultation.  
- Evidence summary | Secondary: Correct answer for screening indication in a patient scenario. |
Supplementary figure 2: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for attendees of the training program (n=106). Using the Wilcoxon test for change between the groups gives $z = -3.41$ ($p<0.001$).

Supplementary figure 3: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for non-attendees of the training program (n=109). Using the Wilcoxon test for change between the groups gives $z = 3.30$ ($p=0.001$).
Web links to program materials openly available online at the website for the Policlinique médicale universitaire de Lausanne:

Decision aid mailed to patients when invited to the cantonal program (20 pages):


Decision box to prepare primary care physicians (2 pages):


Decision board to use during primary care physician consultations (3 pages)


Online link to a shared decision making consultation:

https://m.pmu-lausanne.ch/sites/default/files/pmu_consultation_colon_0_0.webm

Video of the first training session:

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<th>Recommendation</th>
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<tr>
<td>Title and abstract</td>
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<tr>
<td>1</td>
<td>(a) Indicate the study’s design with a commonly used term in the title or the abstract</td>
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<td></td>
<td>(b) Provide in the abstract an informative and balanced summary of what was done and what was found</td>
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<td>$\checkmark$ p. 1</td>
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<tr>
<td>Introduction</td>
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<td>2</td>
<td>Explain the scientific background and rationale for the investigation being reported</td>
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<td>$\checkmark$ p. 4</td>
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<tr>
<td>Objectives</td>
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<td>3</td>
<td>State specific objectives, including any prespecified hypotheses</td>
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<td>$\checkmark$ p. 5</td>
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<td>Methods</td>
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<td>Study design</td>
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<td>4</td>
<td>Present key elements of study design early in the paper</td>
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<td>$\checkmark$ p. 5</td>
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<tr>
<td>Setting</td>
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<td>5</td>
<td>Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection</td>
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<tr>
<td>Participants</td>
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<td>6</td>
<td>(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</td>
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<td>Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</td>
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<td>Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants</td>
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<td>(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed</td>
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<td>Case-control study—For matched studies, give matching criteria and the number of controls per case</td>
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<tr>
<td>Variables</td>
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<td>7</td>
<td>Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable</td>
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<td>$\checkmark$ p. 6-7</td>
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<tr>
<td>Data sources/ measurement</td>
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<td>8*</td>
<td>For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group</td>
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<td>$\checkmark$ p. 7</td>
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<td>Bias</td>
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<td>9</td>
<td>Describe any efforts to address potential sources of bias</td>
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<td></td>
<td>$\checkmark$ p. 7-8</td>
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<tr>
<td>Study size</td>
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<td>10</td>
<td>Explain how the study size was arrived at</td>
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<td>$\checkmark$ p. 5 and p. 8</td>
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<tr>
<td>Quantitative variables</td>
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<td>11</td>
<td>Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why</td>
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<td>$\checkmark$ p. 7-8</td>
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<tr>
<td>Statistical methods</td>
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<td>12</td>
<td>(a) Describe all statistical methods, including those used to control for confounding</td>
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<td>$\checkmark$ p. 7-8</td>
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<td>(b) Describe any methods used to examine subgroups and interactions</td>
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<td>$\checkmark$ p. 8</td>
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<td>(c) Explain how missing data were addressed</td>
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<td>$\checkmark$ Table 1, p. 17</td>
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<td></td>
<td>(d) Cohort study—If applicable, explain how loss to follow-up was addressed</td>
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<td></td>
<td>Case-control study—If applicable, explain how matching of cases and controls was addressed</td>
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<td></td>
<td>Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy</td>
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<td>(e) Describe any sensitivity analyses</td>
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<td>$\checkmark$ p. 8</td>
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Continued on next page
**Results**

| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | \( \checkmark \ p. 3 \) |
| | | (b) Give reasons for non-participation at each stage | \( \times \) *not available.* |
| | | (c) Consider use of a flow diagram | \( \checkmark \) Figure 1. p.17 |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | \( \checkmark \) Table 1. p.16 |
| | | (b) Indicate number of participants with missing data for each variable of interest | \( \checkmark \) Table 1. p.16 |
| | | (c) Cohort study—Summarise follow-up time (eg, average and total amount) | \( n/a \) |
| Outcome data | 15* | Cohort study—Report numbers of outcome events or summary measures over time (Fig. 3) | \( p. 8 + \text{Fig. 2} \) |
| | | Case-control study—Report numbers in each exposure category, or summary measures of exposure |  |
| | | Cross-sectional study—Report numbers of outcome events or summary measures | |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | \( \checkmark \) p.8 + Fig. 2 (6.18) |
| | | (b) Report category boundaries when continuous variables were categorized | \( \checkmark \) Table 1. p.16, supp. Fig. 213 |
| | | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | \( n/a \) |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | \( \checkmark \) (p.14) and supp. materials |

**Discussion**

| Key results | 18 | Summarise key results with reference to study objectives | \( \checkmark \) p. 9 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | \( \checkmark \) p.10.11 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | \( \checkmark \) p.10 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | \( \checkmark \) p.10 |

**Other information**

| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | \( \checkmark \) p.12 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.*

Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

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<td>Date Submitted by the Author:</td>
<td>23-Mar-2016</td>
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| Complete List of Authors: | Selby, Kevin; University of Lausanne, Department of Ambulatory Care and Community Medicine  
Cornuz, Jacques; University of Lausanne, Department of Ambulatory Care and Community Medicine  
Gachoud, David; Centre hospitalier universitaire vaudois Departement de medecine; University of Lausanne, Faculty of Biology and Medicine, Education Unit  
Bulliard, Jean-Luc; Institute of Social and Preventive Medicine, Lausanne University Hospital, Cancer Epidemiology Unit  
Nichita, Cristina; University Hospital of Lausanne, Department of Gastroenterology and Hepatology  
Dorta, Gian; University Hospital of Lausanne, Department of Gastroenterology and Hepatology  
Ducros, Cyril; Canton of Vaud Foundation for Cancer Screening  
Auer, Reto; University of Lausanne, Department of Ambulatory Care and Community Medicine |
| Primary Subject Heading: | Patient-centred medicine |
| Secondary Subject Heading: | General practice / Family practice |
| Keywords: | PRIMARY CARE, MEDICAL EDUCATION & TRAINING, Gastrointestinal tumours < ONCOLOGY |
Training primary care physicians to offer their patients fecal occult blood testing and colonoscopy for colorectal cancer screening on an equal basis: A pilot intervention with before-after and parallel group surveys

Kevin Selby¹, Jacques Cornuz¹, David Gachoud²,³, Jean-Luc Bulliard⁴, Cristina Nichita⁵, Gian Dorta⁵, Cyril Ducros⁶, Reto Auer¹

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Original research article
Word count: 3,329 (max 4,000)
1 Table and 3 Figures
46 references

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Abstract:

Objectives: Primary care physicians (PCPs) should prescribe fecal immunochemical testing (FIT) or colonoscopy for colorectal cancer screening based on their patient’s values and preferences. However, there are wide variations between PCPs in the screening method prescribed. The objective was to assess the impact of an educational intervention on PCPs’ intent to offer FIT or colonoscopy on an equal basis.

Design: Survey before and after training seminars with a parallel comparison through a mailed survey to PCPs not attending the training seminars.

Setting: All PCPs in the canton of Vaud, Switzerland

Participants: Of 592 eligible PCPs, 133 (22%) attended a seminar, of which 106 (80%) filled both surveys. 109 (24%) PCPs who did not attend the seminars returned the mailed survey.

Intervention: A 2-hour-long interactive seminar targeting PCP knowledge, skills and attitudes regarding offering a choice of CRC screening options.

Outcome measures: The primary outcome was PCP intention of having their patients screened with FIT and colonoscopy in equal proportions (between 40 and 60% each). Secondary outcomes were the perceived role of PCPs in screening decisions (from paternalistic- to informed- decision making) and correct answer to a clinical vignette.

Results: Before the seminars, 8% of PCPs reported that they had equal proportions of their patients screened for CRC by FIT and colonoscopy; after the seminar, 33% foresaw having their patients screened in equal proportions (p<0.001). Among those not attending, there was no change (13% vs 14%, p=0.8). Of those attending, there was no change in their perceived role in screening decisions, while the proportion responding correctly to a clinical vignette increased (88% to 99%, p<0.001).

Conclusions: An interactive training seminar increased the proportion of physicians with the intention to prescribe FIT and colonoscopy in equal proportions.

Abstract word count: 287 words (300 max)
Strengths and limitations of this study:

- The training seminars were organized within the implementation of a statewide organized screening program.
- All primary care physicians in canton Vaud, Switzerland were invited to attend the seminars. All those not attending were mailed a survey.
- Twenty two percent of PCPs attended the seminars and 24% not attending returned the mails survey; there was no randomization of PCPs to the intervention, limiting causal inference.
- We only measured changes in intentions to prescribe and verified prescription rates are needed.
Introduction

Screening for colorectal cancer (CRC) reduces CRC mortality and is widely recommended beginning at age 50\(^1,2\). The recommended methods for CRC screening each have varying test characteristics\(^3\); while colonoscopy has high sensitivity for both cancerous and pre-cancerous lesions, allowing screening every 10 years, it is invasive and carries a risk of bleeding and perforation\(^4\). Fecal immunochemical testing (FIT) for occult blood on the other hand has lower sensitivity for pre-cancerous adenomas, but is less costly, can be performed at home without preparation, and has higher acceptability than colonoscopy\(^5,7\). Studies have suggested that in real-world settings the performance of FIT and colonoscopy for detecting cancers are equivalent, making both reasonable first-line choices for screening\(^6,8\).

In contexts where more than one reasonable choice exists, preferences become important\(^9\). Some patients might prefer colonoscopy, thereby accepting a more burdensome screening modality than FIT, while others might prefer FIT, accepting its reduced precision as compared to colonoscopy. Physicians, especially in the United States, have a clear preference for colonoscopy because of its greater sensitivity for and ability to remove pre-cancerous adenomas and polyps\(^10\). Extensive literature has revealed wide geographic variations in the use of preference-sensitive conditions, including CRC screening method\(^11\), that are not explained by differences in patient preferences, but rather by physician preferences and local medical culture\(^12\). These differences persist when looking at the level of individual physicians, not just geographic areas\(^13\). Shared decision making (SDM) might help reduce these unacceptable variations by increasing patient participation in decisions\(^13,14\). Patients’ preferences towards a screening modality are expected to vary between patients within primary care practice\(^7\). Training physicians to identify their patients’ preferences might lead physicians who essentially prescribe their own preferred screening method to prescribe the screening method preferred by their patients and thereby increase the variation of prescribed screening modality within their practice. Reducing the number of physicians who only prescribe one screening modality through preference diagnosis will in turn lead to reduced variation between practices\(^9\).

The Health Department of the canton of Vaud has recently decided to launch the first systematic, statewide, organized CRC screening program in Switzerland that will offer both FIT and colonoscopy to the entire eligible population via a
discussion with their primary care physician (PCP). The aims of the discussion with their PCP are to increase the number of citizens who take an active decision about CRC screening and enable participants to choose between two screening methods within a SDM encounter with their PCP. A decision aid will be mailed informing citizens of the program, the available screening modalities, and encourage discussion with their PCP. Baseline surveys of PCPs in the canton suggest wide variations in baseline PCP preferences, with a predilection for colonoscopy. International literature suggests that physician preference for colonoscopy translates into recommendations to patients focused on colonoscopy alone, with little mention of other screening modalities; this could have negative effects on patient participation and independence. SDM should contribute to reducing variation in care between individual practices.

We administered training seminars for PCPs from the Canton of Vaud prior to the beginning of the screening program. The objectives of the seminar were to improve PCPs knowledge, provide skills and tools needed for SDM with patients, and change the attitudes of PCPs regarding the importance of incorporating patient preferences in CRC screening decisions (supplementary figure 1). We hypothesized that such an intervention would increase the number of PCPs who intend to prescribe FIT and colonoscopy in equal proportions and engage in SDM.

Methods

Study setting and participants

The canton of Vaud is in French-speaking Switzerland and has approximately 740,000 inhabitants, of whom 180,000 are between 50 and 69. A systematic, organized, statewide CRC screening program was launched in the canton in the fall of 2015, the first systematic CRC screening program in Switzerland. Eligible citizens will receive an invitation letter and decision aid explaining the rationale for screening and the choice of FIT and colonoscopy. They are encouraged to visit their PCP, who can discuss screening and provide either a prescription for a FIT kit or referral for colonoscopy. The program comes after a federal decision in 2013 to have screening colonoscopy and FIT be reimbursed by base, obligatory insurance packages; in the setting of a screening program, an inclusion visit with their PCP, the screening test, and diagnostic colonoscopies after a positive FIT are all covered without deductible.
At the end of 2014, all PCPs registered to practice in the Canton Vaud were invited to participate in one of five seminars held in January and February 2015 for the new CRC screening program. The seminars were free of charge and offered Continuing Medical Education (CME) credits and free food. Those who had not been to one of these seminars were mailed an invitation at the end of February to an added session March 24, 2015, along with paper copies of the SDM materials described below, and a questionnaire regarding their CRC screening practices. Ethical approval was not required as we only collected anonymized data through questionnaires from physicians participating in training session and practicing family physicians in the community, as specified by the Swiss Federal Office of Public Health.

Seminars

The seminar lasted two hours. Multiple strategies were employed to achieve the educational objectives, including lectures, interactive elements and discussion, and the use of SDM tools (supplementary figure 1). The lectures summarized the epidemiology of CRC screening, follow-up of polyps and the organization of the screening program, and integrated interactive elements. First, we presented the variation among attending PCPs regarding their preferred screening modality (FIT vs colonoscopy) by using live polling (TurningPoint® technology), along with other knowledge-based multiple choice questions. Second, we used a narrative presenting a patient choosing a FIT test and naming her reasons for choosing FIT rather than colonoscopy in an 8-minute video of an ideal inclusion visit at the PCP office. Third, the video presented a role model of a physician actively going through the process of SDM; we used the suggested framework of Elwyn et al with three stages of SDM (choice talk, option talk, and decision talk), which is meant to allow information sharing by the physician and a safe space for patients to express their preferences. This process was followed by teach-back (having patients repeat back important information), which has been shown to improve retention, especially by patients with low health literacy. Finally, we used elements of risk communication to facilitate the understanding of PCPs of the pros and cons of screening. Communication materials were presented during the session and in context using the video; these included an evidence summary for PCPs (“Decision Box”) based on work of Giguere et al and a decision aid based on current recommendations such as the use of multiple methods to present risk in natural frequencies using text, figures as well as a summary table (supplementary materials).

Questionnaires
We used two paired anonymized questionnaires for the PCPs participating in the seminar, before and after the seminar.

The questionnaires contained a total of 16 questions querying demographics (sex, age, practice characteristics, and personal CRC screening history), screening modalities offered to their patients, preferred communication style and a knowledge question about the appropriate indication for screening (see primary and secondary outcomes section below). We used a similar questionnaire for PCPs not participating, adapting the questions in a single questionnaire.

PCPs not participating to the training had the opportunity to fill the questionnaire on paper or using an identical questionnaire online using the program Survey Monkey®.

**Primary and secondary outcomes**

We aligned our outcomes with our objectives (supplementary figure 1). The primary outcome was the increase in the proportion of PCPs answering that they intended to prescribe FIT and colonoscopy in close to equal proportions. PCPs were asked before the seminar “During recent months, if you prescribed a CRC screening test, to what proportion of your patients did you prescribe each of these tests?”. Attendees filled the percent of each option they currently prescribed on average (colonoscopy, FIT, FOBT, sigmoidoscopy, CT-scan, blood test, other method) and were supposed to arrive at 100% as a sum of the percentages. PCPs reporting that they offered colonoscopy and FIT between 40 and 60% of the time were considered to have offered the two tests in equal proportions. Both guaiac and immunological tests were considered as being a fecal occult blood test, and are referred here in the results as FIT testing, as FIT is the testing modality used by the new screening program. At the end of the session, attendees were asked: “After the start of the screening program, to what proportion of your patients do you intend on prescribing each of these tests?”. We aimed at capturing the variation in screening patterns between attending PCPs and the extent to which the program altered these screening patterns. Several studies suggest that nearly equal proportions of patients prefer non-invasive to invasive modes of CRC screening\(^7,28,29\).

There were two secondary outcomes. First, we aimed at capturing if the seminar was associated with a change in preferred communication style from paternalistic to informed decision making\(^30\). Before the session, we asked PCPs attending: “how are decisions made regarding CRC screening in your practice?”; four answer possible were: “I take decisions myself according to my understanding of the risks and benefits of screening”, “I take the decision myself with
strong consideration of the patient’s opinion”, “I take the decision with the patient on an equal basis” and “The patient
takes the decision according to his/her understanding of the risks and benefits of screening”. This same question was
asked to PCPs not attending. At the end of the session, PCPs attending were queried how they intended to approach
decision making after the start of the screening program using a similar adapted question. The second secondary
outcome was the proportion correctly answering that an asymptomatic 54-year-old woman without a family history of
CRC meets inclusion criteria for screening. Here again, PCP answers after the seminar were compared to the same PCPs
before the training and non-attendees.

Statistical analyses

All questionnaires were completed by the physicians themselves and answers were extracted by one research assistant.
Descriptive statistics were used for demographic characteristics. Chi-squared and t-test statistics were used to compare
physician characteristics and responses between attendees and non-attendees. McNemar’s test for paired data was
used to compare answers from attendees before and after the seminar. Logistic regressions were used to identify
predictors of a change in screening behaviours; we used generalized estimating equations (GEE) logistic regressions with
an exchangeable correlation structure to take into account clustering of the data by participant. We first ran univariate
logistic regressions with the change in screening behaviour as a binary outcome and participant’s sex, diploma year,
practice location and whether they attended the seminar as predictors. As only attending the seminar was significant
with p<0.1 in univariate analyses, the primary analysis was univariate. A sensitivity analysis was performed using a
model with all of the variables. All analyses were performed using STATA version 14 (StataCorp, College Station, Texas,
USA). Results with a two-sided p<0.05 were considered statistically significant.

Results

Of the 592 PCPs registered to practice in the Canton Vaud invited to participate, 133 (22%) attended one of five
seminars (Figure 1), of whom 106 (80%) completed both the before and after questionnaires. 109 of 459 (24%) of PCPs
who had not participated in a seminar returned a questionnaire (Table 1). Seminar attendees were more likely to be
female, have completed their professional diploma more recently, and be in practice with at least one other PCP.
Figure 2 shows the number of PCPs prescribing FIT and colonoscopy in equal proportions at baseline and their intended prescribing after the implementation of the systematic screening program. Among those who participated in the seminar, the proportion of PCPs to prescribe FIT and colonoscopy in equal proportions increased from 8% to 33% (RR: 4.1, 95%CI: 2.2-7.7, p<0.001). We found no change between past and intended future prescribing among non-attendees (13% to 14%, p=0.8) and found a significant difference in intended future prescribing among participants and non-participants (33% vs 14%, p<0.001). We found a significant decrease in the number of PCPs offering only colonoscopy among attendees while we found an increase among non-attendees (supplementary figures 2 and 3). Results from univariate models showed that only attendance to the course was significantly associated with a change in prescribing (OR 1.84, 95%CI: 1.01-3.37), while sex, year of diploma and practice location were not significant <0.1. In sensitivity analyses we included all of the variables in a multivariate model, and attending the course remained significant.

The proportion of physicians reporting that they take decisions regarding CRC together with their patients on an equal basis did not differ between attendees and non-attendees and did not change after the seminar (Figure 3A). The proportion of physicians correctly responding that a 54-year-old asymptomatic woman without risk factors is a candidate for CRC screening increased from 88% to 99% among those who attended the course (p<0.001), while there was no difference in baseline knowledge among those who did and did not attend the course (p=0.4) (Figure 3B).

Discussion

We found a significant increase in the percentage of PCPs intending to prescribe FIT and colonoscopy in equal proportions before and after a seminar focused on increasing knowledge, teaching skills and changing attitudes on CRC screening. We did not find such a difference among PCPs who received paper training materials by mail but did not attend the seminar. The seminar was not associated with a self-reported change in SDM communication style and increased the percentage of PCPs correctly answering a clinical vignette on the indications for CRC screening.

While SDM has frequently been invoked as a way to decrease unwarranted variations in care,14,31,32 there is little literature about whether the implementation of SDM in physician training programs can have an impact on variations in care. The use of patient decision aids alone appears to improve patient decision making and decrease the use of certain
invasive interventions, but a recent systematic review concluded that the implementation of SDM in daily practice is most effective when both patients and physicians are targeted. Several previous programs have shown that physician training in SDM can have an impact on the prescription patterns of PCPs in the setting of overuse of certain preference-sensitive conditions, such as antibiotic prescription and prostate cancer screening. Our study adds to the literature by providing an example encouraging SDM in the context of CRC screening, an effective intervention where SDM might actually increase uptake.

The increase in the percentage of PCPs offering FIT and colonoscopy in equal proportions after the seminar was primarily due to an intention to increase FIT prescribing and a decrease in those providing only colonoscopy (supplementary figure 2). The baseline preference in both attendees and non-attendees was for colonoscopy, with about 20% in both groups reporting that colonoscopy was the only screening modality they had prescribed over the last 6 months, supporting evidence that colonoscopy is becoming the leading screening modality in Switzerland. There was an increase in PCPs prescribing only colonoscopy among non-attendees, possibly because the screening program will provide reimbursement without a deductible. Research has shown that despite guidelines advocating a choice of CRC screening methods, physicians tend to offer only one screening modality, which is most often colonoscopy.

Unfortunately, failure to offer a choice might decrease screening rates.

While we saw an increase in the number of PCPs intending to prescribe FIT and colonoscopy in equal proportions, there was no change in the reported decision-making style. PCPs generally have a positive overall view of SDM but do not find it appropriate to integrate all elements into every preference-sensitive decision. A previous randomized trial of a SDM training program found that PCP-reported decision making style did not change, but patients reported greater involvement in decision making and were less likely to receive antibiotics for respiratory tract infections. Another trial led to a change in PCP behaviours related to prostate cancer screening without any change specific metrics of SDM. It may not be necessary to change a PCP’s reported decision making style in order for them to be more likely to offer the choice of FIT and colonoscopy to their patients.

Our seminar was a multifaceted intervention with lectures, interactivity and discussion and distribution of SDM tools (supplementary figure 1), building on literature that the use of learning methods such as passive lectures only is
insufficient to change physician behavior. Our objectives were located in the three main domains frequently targeted in medical education, specifically knowledge, skills and attitudes. Attitude change was considered especially important, and was targeted using the presentation of variation in prescribing habits within the assembly, a movie with the narrative of a person choosing FIT and role modeling in the video showing a physician during an ideal SDM encounter.

Future interventions to reinforce physician behaviour could include evidence-based interventions such as reminders, academic detailing and provider feedback. The increase in the intention to prescribe both FIT and colonoscopy could be because PCPs felt more competent in offering a choice of screening modalities. Competence in health promotion and disease prevention is a required skill in several medical competency frameworks; specific training in SDM, as demonstrated in our program, could help ensure that physicians perform prevention activities in a way that respects individual patient values and preferences.

Limitations

Our findings are limited by the fact that the attendees were not randomized to attend the training program. While we compared the screening intentions of PCPs not attending the training seminar, we found differences in the baseline demographics of attendees and non-attendees. Beyond these demographic differences, there might be other important differences between attendees and non-attendees which limit causal inference from our program. The demographic make-up of the non-attendees is likely more representative of Swiss primary care. However the response rate among non-responders was low, which limits inferences on the larger population of PCPs in the canton. Data from the two groups were also collected in different circumstances; for the intervention group it was before and after a seminar, while for the comparison group each PCP received the questionnaire through the mail or electronically and we have no information on the time, location and circumstances when the questionnaires were filled. However, the baseline views and practice patterns of the two groups were similar, suggesting that our seminar may be able to produce similar results with other Swiss PCPs. Moreover, the similarity between the baseline views of training attendees and the lack of change in the views of non-attendees suggest that outside secular trends such as increased awareness of CRC screening were less important.
Our outcomes are based on the intention of PCPs to prescribe both screening modalities roughly equally and do not represent actual physician prescribing practices. Further, we surveyed attendees directly before and after the seminar, and it is unclear whether these intentions will be sustained after the return to routine practice where there are often multiple barriers to SDM46. However, other studies have shown that even short educational interventions incorporating films and decision tools can significantly alter the behavior of PCPs35. Future studies will need to compare practice patterns in a carefully performed randomized controlled trial (RCT) and over a significant follow-up before we can infer a causal effect of the training program on reducing variation in care. Also, the seminar was performed by a single multidisciplinary team in one state, which may make it more difficult to implement elsewhere.

Conclusions

An educational intervention focused on SDM in CRC screening appears to have increased the percentage of PCPs intending to prescribe FIT and colonoscopy in equal proportions. This change might decrease variations in care by decreasing the emphasis on physician preferences for one screening modality over another and placing the emphasis on patient preferences. Future studies should test the effect of the intervention within a carefully performed RCT with adequate follow-up and measuring a change in practice to determine whether the change in intended use of FIT and colonoscopy are reflected in practice.

Acknowledgements: The authors thank Isabella Locatelli, PhD, for her help with the choice of statistical analyses, and Céline Braconnier for her help with questionnaire preparation and data entry.

Author contributions: All authors helped design the training program. KS, JC, JLB, CN, GD, CD and RA helped give the training seminars. KS, JC and RA designed and tested the questionnaires. KS and RA collected and analysed the data and wrote the first draft of the paper. All the authors undertook revisions, contributed intellectually to the development of this paper and approved the final manuscript.

Competing interests: The authors have no potential conflicts of interest to disclose.

Funding Sources: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data sharing statement: Primary data and unpublished data are available upon request.
References

39. Smith WR. Evidence for the effectiveness of techniques To change physician behavior. Chest 2000;118:8S-17S.
Figures

Figure 1: Flow of study participants

Figure 2: Physicians prescribing stool-based testing and colonoscopy in similar proportions at baseline and intended future prescribing with the cantonal screening program, stratified by those attending and not attending the seminar.

Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the seminar.
Table 1: Characteristics of primary care physician attendees and non-attendees in the seminars

<table>
<thead>
<tr>
<th></th>
<th>Attendees (n=106)</th>
<th>Non-attendees (n=109)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women (%)</td>
<td>38 (36%)</td>
<td>23 (21%)</td>
<td>0.014</td>
</tr>
<tr>
<td>Age less than 50 (%)</td>
<td>34 (32%)</td>
<td>31 (28%)</td>
<td>0.589</td>
</tr>
<tr>
<td>Year of professional diploma (±SD)</td>
<td>1989 (±10)</td>
<td>1985 (±10)</td>
<td>0.021</td>
</tr>
<tr>
<td><strong>Practice characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solo practice</td>
<td>16 (15%)</td>
<td>51 (47%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2 or more physicians in practice</td>
<td>57 (54%)</td>
<td>28 (26%)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>33 (31%)</td>
<td>30 (28%)</td>
<td></td>
</tr>
<tr>
<td><strong>Practice location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>91 (88%)</td>
<td>80 (83%)</td>
<td>0.384</td>
</tr>
<tr>
<td>Rural</td>
<td>12 (12%)</td>
<td>16 (17%)</td>
<td></td>
</tr>
<tr>
<td><strong>Weekly work schedule</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fewer than 10 half-days per week</td>
<td>7 (7%)</td>
<td>34 (31%)</td>
<td>0.256</td>
</tr>
<tr>
<td>10 or more half-days per week</td>
<td>26 (25%)</td>
<td>74 (69%)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>73 (69%)</td>
<td>1 (1%)</td>
<td></td>
</tr>
<tr>
<td><strong>Have already themselves undergone CRC screening</strong></td>
<td>50 (51%)</td>
<td>58 (53%)</td>
<td>0.696</td>
</tr>
<tr>
<td><strong>Screening test, for those who have undergone screening</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>37 (74%)</td>
<td>55 (95%)</td>
<td></td>
</tr>
<tr>
<td>Stool-based test</td>
<td>8 (16%)</td>
<td>2 (3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline prescribing by screening modality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60% colonoscopy</td>
<td>64 (68%)</td>
<td>61 (56%)</td>
<td></td>
</tr>
<tr>
<td>&gt;60% FIT/gFOBT</td>
<td>19 (20%)</td>
<td>17 (16%)</td>
<td></td>
</tr>
<tr>
<td>Equal stool-based and colonoscopy</td>
<td>8 (9%)</td>
<td>14 (13%)</td>
<td>0.311</td>
</tr>
</tbody>
</table>

FIT: Fecal immunochemical test, FOBT: guaiac fecal occult blood test

# Of those who have undergone CRC screening, 88% have had colonoscopy and 10% a stool-based test.
592 primary care physicians (PCPs) mailed invitation to participate in training seminar

133 (22%) attended seminar

459 (78%) did not attend seminar and received a mail questionnaire

106 (80%) completed questionnaires before and after seminar

109 (24%) completed questionnaire

Figure 1: Flow of study participants
180x150mm (300 x 300 DPI)
Figure 2: Physicians prescribing stool-based testing and colonoscopy in similar proportions at baseline and intended future prescribing with the cantonal screening program, stratified by those attending and not attending the seminar.

217x150mm (300 x 300 DPI)
Figures 3A and 3B: A. Proportion of physicians who report taking decisions regarding colorectal cancer screening decisions together with their patients on an equal basis, at baseline and after the seminar. B. Proportion of physicians correctly responding to a clinical scenario regarding colorectal cancer screening indications, at baseline and after the seminar.
Selby et al. An educational intervention to encourage the equal offer of fecal occult blood testing and colonoscopy for colorectal cancer screening

Online-only supplementary materials

Supplementary figure 1: Overview of the educational intervention.......................................................p. 2
Supplementary figures 2 and 3: Detailed results of change in screening behaviours...........................p. 3
Web links to program materials.............................................................................................................p. 4
**Educational intervention for primary care physicians (PCPs) participating in a colorectal cancer (CRC) screening program**

### Objectives

1. **Knowledge:**
   - Functioning of program.
   - Epidemiology of CRC and polyp follow-up.
   - Presentation of screening modalities.

2. **Skills** and tools needed for shared decision making (SDM).

3. Change in **attitudes:** importance of offering choice and incorporating preferences.

### Interventions

1. **Lecture:**
   - Organisational aspects.
   - Screening indications and follow-up.
   - Performance of each screening test.

2. Interactivity and discussion:
   - Multiple choice questions with live answers.
   - Demonstrating variation between peers.
   - Video of SDM consultation offering the choice.
   - Risk communication techniques.

3. **SDM tools:**
   - Decision aid.
   - Images for consultation.
   - Evidence summary.

### Outcomes

Primary: Intention to prescribe FIT and colonoscopy in close to equal proportions.

Secondary: Communication style that reflects SDM.

Secondary: Correct answer for screening indication in a patient scenario.
Supplementary figure 2: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for attendees of the training program (n=106). Using the Wilcoxon test for change between the groups gives \( z = -3.41 \) (\( p < 0.001 \)).

Supplementary figure 3: Colorectal cancer screening tests prescribed over the last six months and intended future prescribing for non-attendees of the training program (n=109). Using the Wilcoxon test for change between the groups gives \( z = 3.30 \) (\( p = 0.001 \)).
Web links to program materials openly available online at the website for the Policlinique médicale universitaire de Lausanne:

Decision aid mailed to patients when invited to the cantonal program (20 pages):


Decision box to prepare primary care physicians (2 pages):


Decision board to use during primary care physician consultations (3 pages)


Online link to a shared decision making consultation:

https://m.pmu-lausanne.ch/sites/default/files/pmu_consultation_colon_0_0.webm

Video of the first training session:

STROBE Statement—checklist of items that should be included in reports of observational studies

<table>
<thead>
<tr>
<th>Item No</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title and abstract</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(a) Indicate the study’s design with a commonly used term in the title or the abstract</td>
</tr>
<tr>
<td></td>
<td>(b) Provide in the abstract an informative and balanced summary of what was done and what was found</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Explain the scientific background and rationale for the investigation being reported</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
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<tr>
<td>3</td>
<td>State specific objectives, including any prespecified hypotheses</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td></td>
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<tr>
<td>4</td>
<td>Present key elements of study design early in the paper</td>
</tr>
<tr>
<td>5</td>
<td>Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection</td>
</tr>
<tr>
<td>6</td>
<td>(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</td>
</tr>
<tr>
<td></td>
<td>Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants</td>
</tr>
<tr>
<td></td>
<td>(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed</td>
</tr>
<tr>
<td></td>
<td>Case-control study—For matched studies, give matching criteria and the number of controls per case</td>
</tr>
<tr>
<td>7</td>
<td>Variables</td>
</tr>
<tr>
<td></td>
<td>Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable</td>
</tr>
<tr>
<td>8*</td>
<td>Data sources/measurement</td>
</tr>
<tr>
<td></td>
<td>For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group</td>
</tr>
<tr>
<td>9</td>
<td>Bias</td>
</tr>
<tr>
<td></td>
<td>Describe any efforts to address potential sources of bias</td>
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<tr>
<td>10</td>
<td>Study size</td>
</tr>
<tr>
<td></td>
<td>Explain how the study size was arrived at</td>
</tr>
<tr>
<td>11</td>
<td>Quantitative variables</td>
</tr>
<tr>
<td></td>
<td>Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why</td>
</tr>
<tr>
<td>12</td>
<td>Statistical methods</td>
</tr>
<tr>
<td></td>
<td>(a) Describe all statistical methods, including those used to control for confounding</td>
</tr>
<tr>
<td></td>
<td>(b) Describe any methods used to examine subgroups and interactions</td>
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<tr>
<td></td>
<td>(c) Explain how missing data were addressed</td>
</tr>
<tr>
<td></td>
<td>(d) Cohort study—If applicable, explain how loss to follow-up was addressed</td>
</tr>
<tr>
<td></td>
<td>Case-control study—If applicable, explain how matching of cases and controls was addressed</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy</td>
</tr>
<tr>
<td></td>
<td>(e) Describe any sensitivity analyses</td>
</tr>
</tbody>
</table>

Continued on next page
**Results**

**Participants**
13*
(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
(b) Give reasons for non-participation at each stage
(c) Consider use of a flow diagram

**Descriptive data**
14*
(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
(b) Indicate number of participants with missing data for each variable of interest
(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)

**Outcome data**
15*
*Cohort study*—Report numbers of outcome events or summary measures over time
*Case-control study*—Report numbers in each exposure category, or summary measures of exposure

**Main results**
16
(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
(b) Report category boundaries when continuous variables were categorized
(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

**Other analyses**
17
Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

**Discussion**

**Key results**
18
Summarise key results with reference to study objectives

**Limitations**
19
Discuss limitations of the study, taking into account sources of potential bias or imprecision.

**Interpretation**
20
Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence

**Generalisability**
21
Discuss the generalisability (external validity) of the study results

**Other information**

**Funding**
22
Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.