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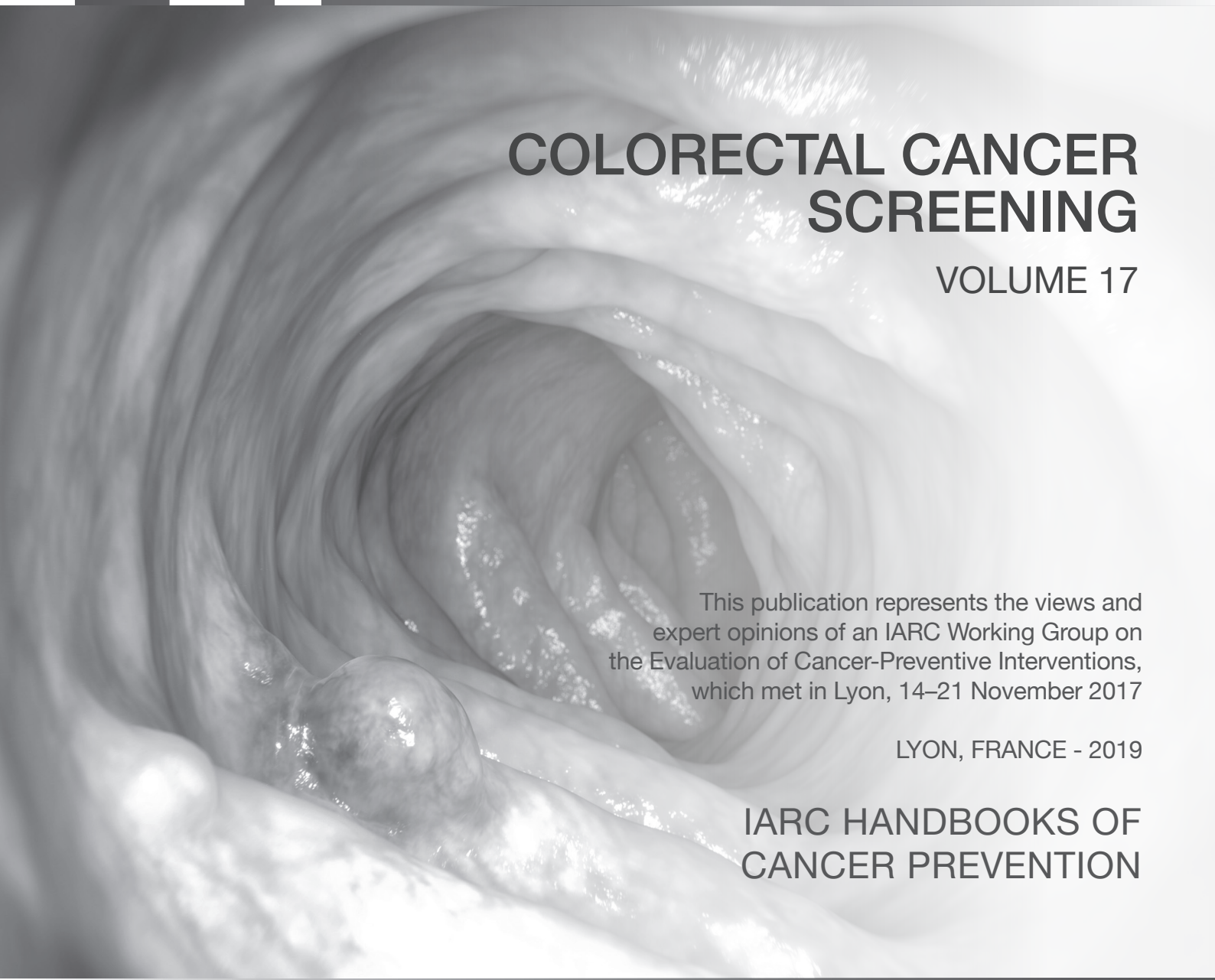

# COLORECTAL CANCER SCREENING

## VOLUME 17

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## 3.6 Participation in screening for colorectal cancer

The conceptual frameworks that have been proposed to analyse factors that influence access to, delivery of, and quality of screening (Green & Kreuter, 2005; Anhang Price et al., 2010; Sabatino et al., 2012) acknowledge that screening is a process of care that occurs in a multilevel environment, including at the policy, organization, provider, and patient levels (Table 3.6.1). The delivery by providers and the use of screening by individuals are influenced by several factors that interact synergistically at these different levels of the health-care system.

### *3.6.1 Determinants of participation in colorectal cancer screening*

#### *(a) At the policy level*

The type of insurance coverage and the cost of the test have been consistently shown to influence screening rates and subjects' preferences for specific tests (Gimeno Garcia et al., 2014; May et al., 2017; White et al., 2017). Insurance status is the most important determinant of use of screening services in the USA, where screening is primarily opportunistic (Gellad & Provenzale, 2010). Also, co-payment [financial participation by the screenee] for a CRC screening test was found to be associated with lower screening rates among subjects with lower income (Fedewa et al., 2015). An analysis of temporal trends in CRC mortality before and after introduction of screening in the USA supports the hypothesis that screening rates are lower in populations with lower (uninsured) socioeconomic status (SES) than in populations with higher SES, and that this difference contributed to the observed widening of the disparity in population mortality (Breen et al., 2017).

Compared with areas where only opportunistic screening is available, higher screening rates have been reported and disparities by SES tended to be smaller in areas where organized programmes had been introduced (Eisinger et al., 2008; Carrozzi et al., 2015a). However, studies conducted within organized FOBT-based programmes (de Klerk et al., 2018) showed substantial differences in participation between the least deprived and the most deprived subjects, suggesting that lower SES may still be a barrier to screening participation even in organized settings. In settings where most CRC screening relies on office-based interventions delivered by primary care physicians, subjects without access to primary care are excluded from participation (Levin et al., 2011; White et al., 2017).

#### *(b) At the organizational level*

##### *(i) Invitation*

Organizational measures that enable subjects to adopt the recommended behaviours play a crucial role. Studies in opportunistic settings showed that delivering informational material was associated with an increase in screening rates only if providers offered support for scheduling screening appointments and subjects were not requested to make arrangements on their own (Costanza et al., 2007; Sequist et al., 2009). There is strong evidence that reminders (i.e. active invitations sent by mail to subjects who are due, or overdue, for CRC screening) are effective in increasing participation in screening (Sabatino et al., 2012; Camilloni et al., 2013). Other factors related to service organization that are consistently inversely related to participation in screening are the amount of time required to perform screening and the distance of the subject's residence from the test provider (Jepson et al., 2000; Federici et al., 2006a; Koo et al., 2012). Population-based programmes provide the organizational framework for reducing inequities in screening access by using call-and-recall systems, which ensure that each eligible subject has the opportunity to participate.

## Table 3.6.1 Determinants of participation in colorectal cancer screening by level of care

| Level of care | Facilitators for participation | Barriers to participation |
|---|---|---|
| Policy | Implementation of organized population-based programmes providing screening and assessment free of charge | Co-payment<br>Lack of insurance coverage when not free of charge<br>Cost of the test |
| Organization of screening | Reminders sent to invitees<br>Reminders sent to providers<br>*Endoscopy screening:*<br>Enhanced office and patient management (invitation letters plus monitoring of response plus motivational interview)[b]<br>*gFOBT/FIT screening:*<br>Mailing of test kits | Distance of the subject's residence from the provider<br>Time required to perform screening<br>Need for the patient to make own arrangements to schedule the test<br>Male sex (FIT)<br>Female sex (endoscopy)<br>Test characteristics (participation in a single round: colonoscopy < sigmoidoscopy < FIT)[c] |
| Provider[a] | *Enabling factors:*<br>GP training focused on communication skills | *Predisposing factors:*<br>Negative attitudes towards screening and prevention<br>Lack of knowledge about screening effectiveness and procedures<br>*Enabling factors:*<br>Lack of time for preventive interventions |
| Patient[a] | *Predisposing factors:*<br>Perceived susceptibility to CRC<br>Informational brochure/enhanced procedural informational brochure<br>Advance notification letter<br>*Reinforcing factors:*<br>Invitation letter signed by GP<br>Family history of CRC or direct experience of CRC affecting relatives or friends<br>*Enabling factors:*<br>Adoption of preventive practice/healthy lifestyle<br>*Endoscopy screening:*<br>Face-to-face counselling[b]<br>Narrative invitation letter (using stories about similar people to counter perceived barriers and cultivate self-efficacy)[b]<br>*gFOBT/FIT screening:*<br>Telephone and text message reminders[b]<br>Telephone contact with a navigator[b]<br>Telephone assistance[b] | *Predisposing factors:*<br>Negative attitudes towards screening and prevention<br>Fatalistic attitude towards cancer<br>Anxiety associated with repeated testing<br>Cultural and religious values<br>Lack of knowledge about screening effectiveness and procedures<br>SES/education level, mediated through differences in knowledge, beliefs (fatalism), and expectations (perceived relative weights of short-term inconveniences and long-term benefits)<br>Ethnicity, mediated through education level, access to care, and knowledge<br>*Enabling factors:*<br>Life difficulties |

CRC, colorectal cancer; FIT, faecal immunochemical test; gFOBT, guaiac faecal occult blood test; GP, general practitioner; SES, socioeconomic status.

[a] Determinants are classified according to the framework of the Precede–Proceed model (Green & Kreuter, 2005).

[b] Assessment conducted in opportunistic settings.

[c] Acceptability of the screening strategies is context-specific, and it may vary across jurisdictions. Assessment of participation should be one of the aims of pilot screening studies.

*(ii) Screening modality*

Multiple tests are currently used for CRC screening, and they have different effectiveness, acceptability, safety, and cost profiles. Dislike of the recommended test appears to be a specific barrier to participation in CRC screening (Lo et al., 2013).

Participation rates in programmes with stool-based tests for blood are higher in women than in men (Klabunde et al., 2015; Ponti et al., 2017), whereas participation rates in endoscopy-based programmes are higher in men than in women (Segnan et al., 2005; Ponti et al., 2017).

*(c) At the provider level*

The involvement of general practitioners (GPs) was shown to be effective in increasing participation in both organized programmes (Grazzini et al., 2000; Raine et al., 2016) and opportunistic settings (Seifert et al., 2008; Koo et al., 2012). Participation in screening was shown to be closely linked to the GP's level of motivation for screening (Federici et al., 2006a) and to the level of support provided by other trusted primary care physicians (Malila et al., 2008), in particular for less-educated people or older people, who are less likely to use written informational material (Senore et al., 2010). However, some studies reported that these populations are less likely to receive advice about CRC screening from a GP or other primary care physician (Sabatino et al., 2008; Ferroni et al., 2012), which would suggest that inadequate GP counselling may contribute to the observed SES-related gradient in participation.

The lack of knowledge of primary care physicians about the effectiveness of recommended screening modalities and about test characteristics and screening protocols appears to be an important barrier to screening participation in several countries (Koo et al., 2012; Honein-AbouHaidar et al., 2016; Muliira et al., 2016). Enhancing health-care providers' knowledge about CRC screening should increase participation in CRC screening. Other provider-associated barriers are failure to recall patients or to identify high-priority patients for screening, and lack of time dedicated to preventive care (Stone et al., 2002).

The characteristics of the provider may also play a role in participation rates. Women may perceive endoscopy examinations to be less embarrassing if they are conducted by a female endoscopist (Menees et al., 2005). The lack of a sex difference in participation rates when sigmoidoscopy screening was delivered by a female nurse (Robb et al., 2010) supports this hypothesis.

*(d) At the patient level*

Lack of awareness of CRC and of the purposes of CRC screening, and negative perceptions or attitudes (e.g. worry about pain, discomfort, embarrassment associated with the test, fear about test results, shyness about being screened, the perception that screening is not necessary, or fatalistic views of cancer) emerge as barriers to screening participation, in both qualitative and quantitative studies, and were consistently associated with a lower participation rate (Galal et al., 2016; Honein-AbouHaidar et al., 2016; Wools et al., 2016). Anxiety associated with regular repetition of screening tests was a strong negative predictor of participation in CRC screening, even among those who believed the screening to be effective (Senore et al., 2010).

Culture- and religion-specific barriers to screening participation may pose additional hurdles, independent of financial considerations, that limit participation in CRC screening. Subjects who hold traditional views of care tend to have lower screening participation, probably as a result of misconceptions about CRC and about screening, a distrust of conventional medicine, or a lack of familiarity with screening tests. Religious objections and cultural background, which may affect an individual's perception of the acceptability of the test, have been reported as

barriers to participation in endoscopy screening (Galal et al., 2016; Honein-AbouHaidar et al., 2016; Taha et al., 2016).

Perceived susceptibility to CRC is a facilitator for participation in screening, although several studies have shown that perception of a high CRC risk may be associated with an increase in participation in endoscopy but not in FOBT (Wools et al., 2016). Health motivation, measured by either the adoption of health-promoting behaviours (e.g. undergoing mammography screening, having a cholesterol check, or visiting a GP or dentist) or the avoidance of unhealthy habits (e.g. smoking or alcohol consumption), has been identified as a factor that is associated with a higher likelihood of participating in CRC screening, although lower participation has been reported among individuals who reported a very healthy lifestyle (Sicsic & Franc, 2014).

The persistent differences in participation in CRC screening by SES, or education level, also in the context of established population-based programmes (de Klerk et al., 2018), may be partially explained by differences in knowledge, beliefs, and expectations (Honein-AbouHaidar et al., 2016; Smith et al., 2016): groups with lower SES may consider screening to be more frightening and less beneficial compared with groups with higher SES, even if screening is publicized in an identical way and is provided free of charge, at a convenient location and time, to all SES groups. Better self-rated health and lower cancer fatalism, which are directly associated with higher participation in FOBT screening, mediate the impact of SES on participation (Miles et al., 2011). Qualitative research findings indicate that cognitive factors, including fatalistic beliefs about CRC (Lo et al., 2013; Honein-AbouHaidar et al., 2016) and the individual's perception of the relative weights of short-term inconveniences and long-term benefits (Whitaker et al., 2011), are associated with SES and mediate the negative impact of social deprivation on participation. Social cognition variables (i.e. knowledge, risk awareness, and attitudes) were shown to be strongly associated with intention but only weakly associated with action; action is better predicted by factors related to life difficulties (Power et al., 2008), which are likely to be associated with higher deprivation levels (Smith et al., 2016).

SES may also mediate the impact of ethnicity on participation: ethnic differences in screening participation tend to decrease (Liss & Baker, 2014), or even to disappear (Doubeni et al., 2010), after adjustment for level of knowledge, SES indicators, or access to care. Also, a screening survey in Italy showed a strong correlation between the participation rate of immigrants and that of Italians by screening programme, suggesting that some structural determinants of accessibility are common to different ethnicities (Turrin et al., 2015).

Studies in different countries reported a positive association between having a family history of CRC or having had direct experience of CRC affecting relatives or friends and the likelihood of responding to an invitation to CRC screening (Koo et al., 2012; Galal et al., 2016; Honein-AbouHaidar et al., 2016), although no such effect was observed in other studies.

Support from a partner plays a strong role: married adults are more likely than non-married adults to participate in CRC screening (Artama et al., 2016; Galal et al., 2016; Wools et al., 2016; Honein-AbouHaidar et al., 2016).

### *(e) Follow-up of subjects with abnormal findings*

The potential reduction of mortality through screening can be achieved only if subjects with abnormal findings receive timely and appropriate follow-up, following evidence-based guidelines. According to reports from surveys monitoring the receipt of appropriate follow-up care by patients with abnormal results, a substantial proportion (8–34%) of subjects with positive

test results are not undergoing the recommended assessment (Yabroff et al., 2003; Ponti et al., 2017).

The following interventions have been found to be successful in increasing the proportion of screen-positive individuals who receive timely follow-up: reducing financial barriers to further investigations and providing reminders by mail or telephone; providing written informational material, telephone counselling, or face-to-face counselling; and addressing fears related to abnormal findings (Bastani et al., 2004; Zorzi et al., 2014).

### 3.6.2 Interventions to increase participation in endoscopy screening

Randomized trials of interventions to increase participation in endoscopy screening (colonoscopy or sigmoidoscopy) are presented in Table 3.6.2. Of the 11 trials found in the literature, seven were of colonoscopy, three were of sigmoidoscopy, and one was of either sigmoidoscopy or colonoscopy. Five of the trials were conducted in the USA and six in Europe. All of the trials in the USA (Denberg et al., 2006; Turner et al., 2008; Ling et al., 2009; Jandorf et al., 2013; Jensen et al., 2014) and two of the trials in Europe (Gray & Pennington, 2000; Boguradzka et al., 2014) assessed participation in the context of opportunistic screening. Of the other four trials in Europe, one assessed participation within a sigmoidoscopy screening trial (Wardle et al., 2003), two assessed participation in subjects identified from population registries (Senore et al., 1996; Blom et al., 2002), and one assessed participation in an organized population-based screening programme (Senore et al., 2015a).

Four trials evaluated patient navigation, management, coaching, or counselling versus a control arm of usual care or an informational brochure or leaflet (Turner et al., 2008; Ling et al., 2009; Jandorf et al., 2013; Boguradzka et al., 2014). Of these trials, two found significantly higher participation in the intervention arm than in the control arm (OR, 1.63; 95% CI, 1.11–2.41 and OR, 5.33; 95% CI, 3.55–8.00), one found an effect of borderline significance (OR, 2.14; 95% CI, 0.99–4.63), and one reported a non-significant effect. An additional trial evaluated different methods of having a patient interact with a nurse coordinator and found no significant difference (Blom et al., 2002).

Four trials evaluated the impact of invitation letters on participation rates (Senore et al., 1996; Ling et al., 2009; Jensen et al., 2014; Senore et al., 2015a). A 2 × 2 factorial study showed that participation was higher with a narrative invitation than with a non-narrative invitation (OR, 4.81; $P < 0.05$), but no significant difference was found for a tailored invitation versus a standard (stock) invitation (Jensen et al., 2014). Another study of a tailored invitation letter versus a non-tailored invitation letter also found no significant difference (Ling et al., 2009). A study of an advance notification letter versus usual care found significant differences (RR, 1.17; 95% CI, 1.10–1.25 and RR, 1.19; 95% CI, 1.12–1.27) (Senore et al., 2015a). A study of personal letters signed by a GP versus a study coordinator found no significant difference (Senore et al., 1996).

Two trials that examined providing an informational brochure versus usual care both found a significant difference, although it was of modest magnitude (Wardle et al., 2003; Denberg et al., 2006). One trial examined the addition of a discussion with the GP to providing an informational leaflet and found no significant difference (Gray & Pennington, 2000).

### 3.6.3 Interventions to increase participation in screening with stool-based tests for blood

More than 25 RCTs have assessed interventions to increase participation in gFOBT and/or FIT screening in asymptomatic individuals at average risk of CRC in high-income

## Table 3.6.2 Randomized trials of interventions to increase participation in endoscopy screening (colonoscopy or sigmoidoscopy)

| Reference | Country | Screening modality | Intervention arm | Control arm | Outcome |
|---|---|---|---|---|---|
| Senore et al. (1996) | Italy | Sigmoidoscopy | Personal letter signed by GP (arm A) | Personal letter signed by study coordinator | 29.3% vs 26.8%* |
| | | | Arm A plus letter signed by well-known scientist (arm B) | Personal letter signed by study coordinator | 24.9% vs 26.8%* |
| Gray & Pennington, (2000) | United Kingdom | Sigmoidoscopy | Informational leaflet and discussion with GP | Informational leaflet only | No significant difference |
| Blom et al. (2002) | Sweden | Sigmoidoscopy | Nurse telephoned patient | Patient instructed to telephone nurse | Uppsala: 50% vs 45%*<br>Malmö/Lund: 31% vs 30%* |
| Wardle et al. (2003) | United Kingdom | Sigmoidoscopy | Psychoeducational booklet | Usual care | 53.5% vs 49.9%** |
| Denberg et al. (2006) | USA | Colonoscopy | Mailed informational brochure | Usual care | OR = 1.20 (95% CI, 1.09–1.33) |
| Turner et al. (2008) | USA | Colonoscopy | Peer coaching | Mailed brochure | OR = 2.14 (95% CI, 0.99–4.63) |
| Ling et al. (2009) | USA | Colonoscopy or sigmoidoscopy | Tailored invitation letter | Non-tailored invitation letter | OR = 1.08 (95% CI, 0.72–1.62) |
| | | | Enhanced patient management | Non-enhanced patient management | OR = 1.63 (95% CI, 1.11–2.41) |
| Jandorf et al. (2013) | USA | Colonoscopy | Peer navigation; health professional navigation | Usual care | No significant differences |
| Boguradzka et al. (2014) | Poland | Colonoscopy | Counselling | Informational leaflet | OR = 5.33 (95% CI, 3.55–8.00) |
| Jensen et al. (2014) | USA | Colonoscopy | Narrative invitation | Non-narrative invitation | OR = 4.81** |
| | | | Tailored invitation | Stock invitation | OR = 1.19* |
| Senore et al. (2015a) | Italy | Sigmoidoscopy | Advance notification letter (arm B) | Usual care | RR = 1.17 (95% CI, 1.10–1.25) |
| | | | Arm B plus offer of contacting GP (arm C) | Usual care | RR = 1.19 (95% CI, 1.12–1.27) |

CI, confidence interval; GP, general practitioner; OR, odds ratio; RR, relative risk.
*$P > 0.05$.
**$P < 0.05$.

countries (Australia, Israel, and countries in North America and western Europe). In view of the very large number of RCTs, the main focus of this section is on recent systematic reviews.

The most recent systematic review (Rat et al., 2017a) included RCTs published up to September 2015 (Table 3.6.3). The 24 RCTs that met the inclusion criteria were categorized according to whether the intervention focused on information provided to those invited to screening, physician practice, or type of test (i.e. gFOBT vs FIT). The interventions that increased participation in gFOBT and/or FIT screening were: advance notification letter (OR, 1.20–1.51); postal mailing of kits (OR, 1.31–2.89); written, telephone, and text message reminders (OR, 1.94–7.70); and telephone contact with an advisor (OR, 1.36–7.72). The interventions focused on physician practice that were effective were an invitation letter signed by a GP (OR, 1.26), GP training focused on communication skills (OR, 1.22), and reminder letters sent to GPs (OR, 14.8). For RCTs that compared gFOBT with FIT, the results were mixed.

In the USA, the Community Preventive Services Task Force published an update of its systematic review on the effectiveness of interventions to increase participation in cancer screening (Sabatino et al., 2012), based on published literature up to October 2008. Interventions were categorized as increasing community demand for screening, reducing barriers to access, and increasing screening service delivery by health-care providers. One-on-one education, client reminders, and reducing structural barriers were effective in increasing use of CRC screening.

The results of another systematic review (Senore et al., 2015b) indicated that multifactor interventions that target factors outside the control of individual clinicians are most effective in increasing participation in gFOBT and/or FIT. In organized CRC screening programmes (implying that there are no financial barriers to the potential participant), letters of invitation, especially if signed by the person's GP, and reminder letters sent to non-participants were found to be effective in increasing participation. Physician reminders were also found to increase participation in screening.

A three-group cluster RCT (Rat et al., 2017b), completed after the most recent meta-analysis and conducted within the organized CRC screening programme in France, reported that providing GPs with a list of their patients who were not up to date with screening was associated with a small increase in the participation rate in FIT screening. At 1 year, the participation rate in screening was 24.8% (95% CI, 23.4–26.2%) in the group who received specific reminders, 21.7% (95% CI, 20.5–22.8%) in the group who received generic reminders, and 20.6% (95% CI, 19.3–21.8%) in the usual care group.

### *3.6.4 Comparison of participation in two screening methods*

#### *(a) Comparing stool-based tests for blood*

A meta-analysis of seven informative comparative trials (Vart et al., 2012) reported a higher participation among people invited to FIT than among those invited to gFOBT (RR, 1.21; 95% CI, 1.09–1.33). Also, the adoption of FIT in some population-based programmes in the United Kingdom resulted in a reduction in the participation gap by age, sex, and deprivation level observed in the gFOBT-based programmes (Digby et al., 2013; Moss et al., 2017).

#### *(b) Comparing endoscopic methods*

In a trial in Italy (Segnan et al., 2007), participation was significantly lower among subjects invited to colonoscopy than among those invited to sigmoidoscopy screening (27% vs 32%; OR, 0.74; 95% CI, 0.68–0.80).

Two studies also assessed the impact of offering a choice between different tests on participation. In the study in Italy (Segnan et al., 2005), participation was lower among subjects who were

## Table 3.6.3 Randomized trials of interventions to increase participation in screening for colorectal cancer with stool-based tests for blood

| Reference | Country | Type of intervention | Participation rate (%) | OR (95% CI) |
|---|---|---|---|---|
| *Advance notification letter* | | | | |
| van Roon et al. (2011) | The Netherlands | NA | 57.8 vs 51.5 | 1.20 (1.07–1.34) |
| Cole et al. (2007) | Australia | NA | 25.2 vs 18.2 | 1.51 (1.13–2.02) |
| Mant et al. (1992) | United Kingdom | NA | 31.7 vs 25.5 | 1.35 (0.99–1.87) |
| *Postal mailing of kits* | | | | |
| Mant et al. (1992) | United Kingdom | NA | 25.5 vs 20.6 | 1.31 (0.98–1.85) |
| Ore et al. (2001) | Israel | NA | 19.9 vs 15.9 | 1.31 (1.04–1.67) |
| Giorgi Rossi et al. (2011)[a] | Italy | NA | 14.6 vs 10.7 | 1.42 (1.18–1.71) |
| Giorgi Rossi et al. (2011)[b] | Italy | NA | 63.0 vs 56.8 | 1.30 (1.12–1.5) |
| Green et al. (2013) | USA | NA | 50.8 vs 26.3 | 2.89 (2.42–3.45) |
| Tinmouth et al. (2015) | Canada | NA | 20.1 vs 9.6 | 2.35 (1.93–2.90) |
| *Presentation and content of written information* | | | | |
| Myers et al. (2014) | USA | Message focusing on loss vs gain | 36 vs 40 | 0.87 (0.73–1.03) |
| Multicentre Australian Colorectal-neoplasia Screening (MACS) Group (2006) | Australia | Shared decision-making | 27.4 vs 18.6 | 1.65 (1.04–2.64) |
| Cole et al. (2007) | Australia | Advocacy messages or messages focusing on risk | 40.3 vs 36 | 1.20 (0.95–1.53) |
| Hewitson et al. (2011) | United Kingdom | Enhanced procedural informational leaflet | 58.2 vs 52.2 | 1.26 (1.01–1.58) |
| Neter et al. (2014) | Israel | Implementation intentions | 71.4 vs 67.9 | 1.18 (1.12–1.24) |
| *Reminders* | | | | |
| Lee et al. (2009) | USA | Educational patient reminder by mail | 64.6 vs 48.4 | 1.94 (1.45–2.60) |
| Green et al. (2013) | USA | Mailed reminder letters | 57.5 vs 50.8 | 1.31 (1.11–1.55) |
| Baker et al. (2014) | USA | Telephone and text message reminders | 73.8 vs 26.7 | 7.70 (4.98–12.03) |
| *Telephone contacts with a navigator, medical assistant, or nurse* | | | | |
| Myers et al. (2014) | USA | Telephone call with instructions | 48 vs 37 | 1.57 (1.27–1.92) |
| Green et al. (2013) | USA | Telephone assistance | 64.7 vs 57.5 | 1.36 (1.14–1.61) |
| Baker et al. (2014) | USA | Telephone contact with a personal navigator for non-compliant patients | 82.2 vs 37.3 | 7.72 (4.91–12.3) |
| Myers et al. (2014) | USA | Telephone contact with a navigator | 21.5 vs 15.3 | 1.51 (1.03–2.24) |
| *Video and computers* | | | | |
| Gimeno-García et al. (2009) | Spain | Video-based educational intervention | 69.9 vs 54.4 | 1.91 (0.95–3.89) |
| Miller et al. (2005) | USA | Counselling provided by automated informatics software | 62 vs 63 | 0.96 (0.51–1.79) |

## Table 3.6.3 (continued)

| Reference | Country | Type of intervention | Participation rate (%) | OR (95% CI) |
|---|---|---|---|---|
| *Intervention requiring GP involvement* | | | | |
| Hewitson et al. (2011) | United Kingdom | Invitation letter signed by GP | 58.1 vs 52.3 | 1.26 (1.01–1.58) |
| Aubin-Auger et al. (2014) | France | GP training focused on communication skills | 36.7 vs 24.5 | 1.22 (1.07–1.41) |
| Vinker et al. (2002) | Israel | Reminder letters sent to GPs | 16.5 vs 1.2 | 14.8 (8.1–29.6) |

CI, confidence interval; GP, general practitioner; NA, not applicable; OR, odds ratio.

[a] Non-responders to a first invitation.

[b] Responders in the previous round.

Adapted from Rat C, Latour C, Rousseau R et al., Interventions to increase uptake of faecal tests for colorectal cancer screening: a systematic review, *European Journal of Cancer Prevention*, volume 27, issue 3, doi:10.1097/CEJ.0000000000000344. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved. (Rat et al., 2017a).

offered a choice between FIT and sigmoidoscopy (27.1%) than among those who were invited to undergo screening with either biennial FIT (28.1–30.1%) or sigmoidoscopy (28.1%), although the difference was not statistically significant. A trial in Australia (Multicentre Australian Colorectal-neoplasia Screening (MACS) Group, 2006) found that the participation rate of people who were offered a choice between FIT, FIT plus sigmoidoscopy, CT colonography, and colonoscopy was not higher than that of those invited to screening with FIT (27% vs 23%; $P = 0.3$). [The Working Group noted that the sample size was rather small, and thus the results were statistically uncertain.]

In a population-based programme in Italy (Senore et al., 2013), the sequential offer of sigmoidoscopy followed by invitation to FIT for those who refused sigmoidoscopy was shown to be an effective approach, resulting in a participation rate of 19% among those who refused sigmoidoscopy. Similar findings have been reported in a pilot screening study in the Netherlands (Hol et al., 2012).

### *(c) Comparing endoscopy-based and stool-based strategies*

The characteristics of studies that compared participation rates in screening with endoscopy-based and stool-based strategies, offered either alone or in combination, are presented in Table 3.6.4.

#### *(i) Sigmoidoscopy and stool-based tests for blood*

Three trials compared the participation in relation to invitation to gFOBT plus sigmoidoscopy screening versus gFOBT screening alone in three different countries. In a study in the United Kingdom (Berry et al., 1997), participation in screening with gFOBT was similar to that in gFOBT plus sigmoidoscopy (50% vs 48%), but only 20% of subjects invited to screening with gFOBT plus sigmoidoscopy actually underwent sigmoidoscopy. In a similar study in Denmark (Rasmussen et al., 1999), the participation rate was 40% among subjects invited to screening with gFOBT plus sigmoidoscopy, compared with 52% among those invited to screening with gFOBT alone. Similar results were reported in a study in Sweden (Brevinge et al., 1997) that compared subjects invited to screening with gFOBT and those invited to screening with gFOBT plus sigmoidoscopy (61% vs 39%; $P < 0.001$), but the difference was reduced when comparing subjects invited to screening with gFOBT and those invited to screening with sigmoidoscopy alone (55% vs 49%; $P < 0.01$).

In a trial in Australia, screening with FIT plus sigmoidoscopy was associated with a decrease in participation compared with screening with FIT alone (14% vs 27%; $P < 0.001$) (Multicentre Australian Colorectal-neoplasia Screening (MACS) Group, 2006). In a trial in Italy that randomized the practices of GPs to screening with either gFOBT or sigmoidoscopy, the observed participation rates were 17% with gFOBT and 7% with sigmoidoscopy ($P < 0.001$) (Federici et al., 2006b). In two studies in Italy (Segnan et al., 2005, 2007), the participation among subjects invited to screening with FIT was similar to that among those invited to screening with sigmoidoscopy, with participation rates of 28% and 32%, respectively, in both groups. In a study in the Netherlands (Hol et al., 2010), participation was higher among subjects invited to screening with FIT than among those invited to screening with sigmoidoscopy (61% vs 32%; $P < 0.001$).

#### *(ii) Colonoscopy and stool-based tests for blood*

In the COLONPREV study in Spain, participation was lower in the colonoscopy arm than in the FIT arm (34% vs 25%; $P < 0.001$), and if the invited participants were given the opportunity to choose the method, more participants were interested in screening with FIT than in undergoing a colonoscopy (Quintero et al., 2012).

**Table 3.6.4 Characteristics of studies comparing participation rates in screening for colorectal cancer with a stool-based test for blood versus an endoscopic method, or in combination**

| Reference | Types of tests | Eligible patients | Age range (years) |
|---|---|---|---|
| Berry et al. (1997) | gFOBT vs gFOBT+FS | 6371 | 50–74 |
| Brevinge et al. (1997) | gFOBT vs gFOBT+FS<br>gFOBT vs FS | 3183 | 55–56 |
| Rasmussen et al. (1999) | gFOBT vs gFOBT+FS | 10 978 | 50–75 |
| Segnan et al. (2005) | gFOBT vs FS | 22 676 | 55–64 |
| Federici et al. (2006b) | gFOBT vs FS | 2987 | 50–74 |
| Multicentre Australian Colorectal-neoplasia Screening (MACS) Group (2006) | FIT vs FS+FIT vs colonoscopy | 672 | 50–54 |
| Segnan et al. (2007) | FIT vs FS or colonoscopy | 18 114 | 55–64 |
| Hol et al. (2010) | gFOBT or FIT vs FS | 14 341 | 50–74 |
| Lisi et al. (2010) | gFOBT vs colonoscopy | 8378 | 55–64 |
| Quintero et al. (2012) | FIT vs colonoscopy | 57 302 | 50–69 |

FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; gFOBT, guaiac faecal occult blood test.
Adapted from Hassan et al. (2012). Meta-analysis: adherence to colorectal cancer screening and the detection rate for advanced neoplasia, according to the type of screening test. *Alimentary Pharmacology & Therapeutics*, 36(10): 929–940, with permission from John Wiley & Sons. (Hassan et al., 2012).

Similar results were reported in a trial in Italy (Segnan et al., 2007), which found lower participation rates with colonoscopy than with FIT screening (27% vs 32%; $P < 0.001$).

In another trial conducted in Italy that randomized the practices of GPs to screening with either gFOBT or colonoscopy, the observed participation rates were 27% with gFOBT and 10% with colonoscopy ($P < 0.001$) (Lisi et al., 2010). Similar findings were reported from a study in Australia (Multicentre Australian Colorectal-neoplasia Screening (MACS) Group, 2006), which found participation rates of 27% with FIT and 18% with colonoscopy ($P < 0.02$). [The Working Group noted that the sample size of the Australian RCT was rather small, and thus the results were statistically uncertain.]

### *(iii) Meta-analysis*

A recent meta-analysis, which included 9 of the 10 studies considered here, concluded that endoscopy tests were associated with lower participation compared with stool-based tests for blood (RR, 0.67; 95% CI, 0.56–0.80), although the statistical heterogeneity across the studies was high (Hassan et al., 2012).

[The Working Group noted that all studies comparing endoscopy versus stool-based tests for blood reported data on participation for a single invitation round. Hence, this approach tends to overestimate the difference in participation between stool-based tests for blood and endoscopy strategies, because a single endoscopy is efficient to achieve the expected protective effect, whereas repeated testing is required in stool-based tests for blood. For stool-based tests, the proportion of regular attendees tends to decrease over time.]

### *(e) Comparing CT colonography and other screening methods (endoscopy-based or stool-based strategies)*

Four studies were identified that compared participation in CT colonography with that in colonoscopy, sigmoidoscopy, or FIT. In the COCOS trial in the Netherlands, Stoop et al. (2012) compared participation in screening with colonoscopy and CT colonography among adults aged 50–74 years. The proportion of invitees that

participated was significantly higher for CT colonography (34%) than for colonoscopy (22%). In the SAVE trial, Sali et al. (2016) investigated the participation rates for FIT, colonoscopy, and CT colonography with reduced or full bowel preparation. A reduced preparation for CT colonography increased the participation rate for CT colonography (28% vs 25%; $P = 0.047$); the participation rate was highest for FIT (50%) and lowest for colonoscopy (14%). In the Proteus trial, Regge et al. (2017) reported that the participation rates of individuals aged 58–60 years who were invited to screening with either CT colonography or sigmoidoscopy were similar (30% vs 27%). Moawad et al. (2010) sought to determine patient preferences between colonoscopy and CT colonography in an open access system. A total of 250 consecutive asymptomatic adults at average risk undergoing CRC screening completed a survey that assessed their reasons for choosing CT colonography rather than colonoscopy. Convenience was the most commonly cited reason for choosing CT colonography over other tests. Of the 250 patients, 91 reported that they would not have undergone screening if an option for CT colonography had not been available, and 95% of adults who had undergone both procedures ($n = 57$) reported that they preferred CT colonography. Overall, it is generally observed that participation in CT colonography is higher than that in colonoscopy, lower than that in FIT, and similar to that in sigmoidoscopy.

### *3.6.5 Informed decision-making*

Cancer screening should be promoted and offered only if the benefits clearly outweigh the harms. However, because the risk of CRC and death from CRC is relatively low (often in the range of 2–10%), the balance between potential benefits and harms may be different for different individuals. Therefore, it is prudent to involve the target population in the decision-making process about participation in the screening programme. The decision about participation needs to take into account personal values and preferences. Enthusiastic persuasion and "nudging" (the purposeful alteration of choices presented to people, to influence their decisions) for participation in screening programmes are discouraged (Editorial, 2009; Woloshin et al., 2012).

Shared decision-making, a concept that has evolved in recent years, should be used to facilitate an informed choice about whether to participate in cancer screening programmes. For shared decision-making, transparent, comprehensive, and informative facts should be provided about the potential benefits and harms of screening, and the expected burden of the screening test and follow-up procedures should be clearly explained. Informational material for decision-making in cancer screening programmes is often derived with the help of stakeholders and organizations and individuals who are not involved in the screening programme (Editorial, 2009).

Key features of informed decision-making in cancer screening include (i) the use of innovative visual decision aids to facilitate the transfer of information to all target individuals, irrespective of education, SES, and previous knowledge, (ii) the use of absolute risks of disease and absolute effects and harms of the screening tests and of the follow-up treatment, and (iii) frequent updating of decision aids with new knowledge and evidence (Agoritsas et al., 2015).

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