CHRISTMAS 2008: SEASONAL FAYRE

The impact of appointments timed in proximity to annual milestones on compliance with screening: randomised controlled trial

Geir Hoff, professor of medicine and head of hospital research,^{1,2,3} Michael Bretthauer, gastrointestinal endoscopist and editorial fellow^{1,4,5}

¹Cancer Registry of Norway, Oslo, Norway

²Department of Medicine, Telemark Hospital, Norway

³University of Oslo

⁴Department of Gastroenterology, Rikshospitalet University Hospital, Oslo

⁵New England Journal of Medicine, Boston, USA

Correspondence to: G Hoff, Cancer Registry of Norway, Majorstuen, 0304 Oslo, Norway
hofg@online.no

Cite this as: *BMJ* 2008;337:a2794
doi:10.1136/bmj.a2794

ABSTRACT

Objective To investigate whether appointments for screening timed in proximity to annual milestones (birthdays, Christmas and New Year) may be used as a strategy to improve attendance for screening for colorectal cancer.

Design Randomised controlled trial.

Setting City of Oslo (urban) and Telemark county (urban and rural), Norway.

Participants 12 960 screened adults (64.7% of those invited).

Main outcome measure Attendance rates for each week and month of assigned appointment.

Results Attendance rates were significantly higher in December than the rest of the year (72.3% v 64.6%, $P<0.001$) in adults who received an invitation in the week of their birthday or were assigned to screening in the first or second week after their birthday (67.9% v 64.5%, $P=0.007$). This effect was most pronounced in the urban population of Oslo. In a multivariable logistic regression model, attendance improved in those who received an invitation in the week of their birthday or were assigned to screening in the first or second week after their birthday (odds ratio 1.15, 95% confidence interval 1.03 to 1.28) and those who were assigned to screening in December (odds ratio 1.45, 1.16 to 1.82).

Conclusion Attendance rates for screening for colorectal cancer were higher in December and around attendees' birthdays, the latter particularly in an urban population. Compliance with screening programmes may therefore be improved by timing invitations in proximity to annual milestones.

Trial registration Clinical Trials NCT00119912.

INTRODUCTION

Colorectal cancer is the third most incident cancer worldwide, with more than 1 million new cases detected every year.¹ At least 75% of these cases are sporadic, with age as the main risk factor. Although several barriers have been identified as contributing to low attendance for screening,^{2,3} age as a motivating

factor has not been assessed. In a small study of screening using flexible sigmoidoscopy, the local press highlighted age as a risk factor for colorectal cancer at the time the invitations were posted. Invitees were given an appointment for screening within weeks after their birthday. This study, Telemark Polyp Study 1 (TPS-1), achieved an attendance rate of 81%,⁴ but it was uncertain if the timing of invitations was important and if this strategy was worth adopting in screening programmes with poor attendance. The recently implemented national screening programme for bowel cancer in Australia aims to invite adults for screening within two or three months of their birthday,⁵ but this is for practical reasons and not a strategy chosen to improve attendance (Graeme Young, personal communication, 2008).

In a large study of screening for colorectal cancer using flexible sigmoidoscopy carried out in Norway during 1999-2001,⁶ appointments were randomly allocated to 20 780 adults throughout the three year screening period. We investigated whether invitations timed in proximity to annual milestones (birthdays, Christmas and New Year) had an impact on compliance with screening.

METHODS

The Norwegian Colorectal Cancer Prevention Trial 1 (NORCCAP-1) is a randomised controlled trial of flexible sigmoidoscopy or flexible sigmoidoscopy combined with faecal occult blood testing as screening modalities. Details of the study are published elsewhere.⁷ Briefly, 20 780 adults (male to female ratio 1:1) aged 50-64 were randomly identified from the population registries of the City of Oslo (urban area) and Telemark county (urban and rural areas), Norway and invited to screening. Invitations were posted six or seven weeks before the assigned appointment. The population in the screening areas is predominantly ethnic Norwegian. The remaining relevant age cohorts in the screening areas constituted the control group ($n=79\,430$), who were not invited to

screening. Statistics Norway independently randomised participants in the intervention arm (1:1) to once only screening with flexible sigmoidoscopy or to flexible sigmoidoscopy with faecal occult blood testing. The proposed dates for appointment were randomly allocated on an individual basis by a computerised procedure developed for the study. In total, 777 adults were excluded after randomisation to the screening group but before screening, according to defined criteria.⁶ The participants gave written informed consent to take part in the study. The end points of the study were incidence of and death from colorectal cancer. The present study on attendance in relation to annual milestones was not a prespecified analysis of the trial.

We calculated the distribution of screening appointments according to birth month of those invited to screening and used the χ^2 test for statistical significance. To determine variables that contributed to attendance we used logistic regression analyses. We first tested the variables of interest (age, sex, screening modality, centre, time of appointment, and time of appointment in relation to birthday) in univariable analyses, and then incorporated these in a multivariable model. The association between the variables and attendance was expressed as odds ratios with 95% confidence interval. We used SPSS version 14.0 for analyses.

RESULTS

Overall, 12 960 of 20 003 invited adults (64.7%) attended screening for colorectal cancer. Attendance was higher for women than for men (66.0% *v* 63.5%, $P<0.001$) and higher in Telemark than in Oslo (71.4% *v* 58.0%, $P<0.001$; table 1). Higher attendance rates were observed with increasing age (table 1). In both sexes a higher attendance rate was seen with increasing age—61.6% (age 50–54), 66.4% (age 55–59), and 66.8% (age 60–64; $P<0.001$). The attendance rate for adults with a 50 year, 55 year, or 60 year anniversary in their year of screening was similar to that of other participants, irrespective of sex.

With the exception of January, February, and March, random allocation achieved a similar distribution for screening month irrespective of month of birth.

Weekly attendance rates showed peaks in the first and second weeks and sixth and seventh weeks after birthdays; the sixth and seventh weeks after birthdays corresponding to receipt of invitations in the week of a birthday. Overall, 1095 of 1613 (67.9%) participants who had been assigned to screening in the first, second, sixth, and seventh weeks after birthdays attended for screening compared with 11 866 of 18 390 (64.5%) who had been assigned to screening in any other week ($P=0.007$). In a subgroup analysis this difference was statistically significant in the Oslo population, where 62.0% (482/778) of participants attended screening appointments in the first, second, sixth, and seventh weeks after birthdays compared with 57.7% (5255/9105) in any other week ($P=0.02$). For Telemark, the corresponding values were 73.4% and 71.2% ($P=0.17$).

Attendance according to calendar month was significantly different, with 72.3% attendance in December as the highest and 62.5% in March as the lowest (table 2). In Oslo, attendance in December compared with the rest of the year was 66.8% (181/271) *v* 57.8% (5556/9612; $P=0.003$) and in Telemark it was 79.3% (169/213) *v* 71.2% (7055/9907; $P=0.009$), giving a difference of 72.3% compared with 64.6% for Oslo and Telemark combined ($P<0.001$).

A multiple logistic regression analysis confirmed the univariable analyses, with a significant improvement in attendance shown in December (adjusted odds ratio 1.45, 95% confidence interval 1.16 to 1.82, $P=0.001$; table 2). Similarly, invitations timed in proximity to the recipients' birthday had an independent influence on attendance rates. The adjusted odds ratio for attendance when given an appointment for screening in the first, second, sixth, or seventh weeks after a birthday compared with any other week was 1.15 (95% confidence interval 1.03 to 1.28; $P=0.01$). Independent predictors of attendance were age, female sex, screening modality, and geographical area of residence (table 2).

DISCUSSION

Compliance with screening for colorectal cancer in Norway was significantly increased in adults invited for screening in December and close to their birthday. To

Table 1 | Attendance rates for colorectal cancer screening using flexible sigmoidoscopy (FS) alone or combined with faecal occult blood testing in Norway

Variable	Men			Women		
	No invited to screening	No screened	Attendance rate (%)	No invited to screening	No screened	Attendance rate (%)
Total	9916	6299	63.5	10 086	6661	66.0
Oslo	4914	2825	57.5	4968	2911	58.6
Telemark	5002	3474	69.5	5117	3749	73.3
Age group (years):						
50–54	3587	2161	60.2	3564	2246	63.0
55–59	3914	2573	65.7	3893	2611	67.1
60–64	2415	1565	64.8	2629	1804	68.6
FS alone	4970	3256	65.5	5042	3438	68.2
FS with faecal occult blood testing	4946	3043	61.5	5044	3223	63.9

Table 2 | Logistic regression with odds ratio for attendance at screening for colorectal cancer in Norway

Variable	No of examinations	Attendance rate (%)	Crude odds ratio (95% CI)	Adjusted odds ratio* (95% CI)	P value
Age	20 003		1.03 (0.02 to 1.03)	1.02 (1.02 to 1.03)	<0.001
Men	9917	63.5	Reference	—	
Women	10 086	66.0	1.12 (1.05 to 1.18)	1.11 (1.05 to 1.18)	<0.001
Screening group:					
FS	10 013	66.9	Reference	—	
FS with faecal occult blood testing	9990	62.7	0.83 (0.79 to 0.88)	0.82 (0.77 to 0.87)	<0.001
Place of residence:					
Oslo	9883	58.0	Reference	—	
Telemark	10 120	71.4	1.80 (1.70 to 1.91)	1.81 (1.71 to 1.92)	<0.001
Screening weeks related to birthday:					
Any but weeks 1, 2, 6, and 7 after birthday†	18 390	64.5	Reference	—	
1, 2, 6, or 7 after birthday†	1613	67.9	1.16 (1.04 to 1.30)	1.15 (1.03 to 1.28)	0.01
Month of screening‡:					
January	2012	65.7	Reference	—	
February	2028	65.1	0.98 (0.86 to 1.11)	1.00 (0.87 to 1.14)	0.95
March	1915	62.5	0.87 (0.76 to 0.99)	0.88 (0.77 to 1.00)	0.06
April	1452	63.7	0.92 (0.80 to 1.06)	0.96 (0.83 to 1.11)	0.57
May	1857	66.1	1.02 (0.89 to 1.16)	1.07 (0.93 to 1.23)	0.33
June	1502	63.6	0.91 (0.79 to 1.05)	0.95 (0.82 to 1.09)	0.47
August	2129	63.6	0.91 (0.80 to 1.03)	0.92 (0.81 to 1.04)	0.19
September	2282	65.8	1.00 (0.88 to 1.14)	1.01 (0.89 to 1.14)	0.93
October	2224	65.2	0.98 (0.86 to 1.11)	1.01 (0.89 to 1.15)	0.86
November	2118	64.1	0.93 (0.82 to 1.06)	0.98 (0.86 to 1.11)	0.74
December	484	72.3	1.36 (1.10 to 1.70)	1.45 (1.16 to 1.82)	0.001

FS=flexible sigmoidoscopy.

*Adjusted for age, sex, screening modality, screening centre, allotted time for screening in weeks 1, 2, 6, or 7 after birthday and month for allotted screening appointment.

†Weeks 6 and 7 for screening appointment correspond to invitations received in birthday week.

‡P=0.009 (χ^2) for attendance in January to December. No screening in July because of summer holidays.

our knowledge, no other studies have assessed the timing of invitations and the effect on attendance for screening. Invitations to screening at particular times may improve compliance with screening and thus the effectiveness of screening for prevention and early detection of the target disease. Perception of ageing may be the key factor, but other mechanisms such as “housekeeping business” or simply “getting things done” before annual milestones may also be considered as explanations for the observed difference in attendance.

Strengths and limitations

The strength of this study is its large size and population based design supporting good validity of the results. A weakness is the generalisability of the findings to other countries, as the Norwegian population studied may differ from other screening populations. Furthermore, appointment times in December were limited to the first two weeks of this month owing to closure for the holiday period. Invitations for any other month were scheduled for all weeks. This may potentially introduce bias. However, when attendance in December was analysed with the first and second weeks in any other

month, attendance still remained high (data not shown). Thus, bias seems unlikely as a result of differences in available appointments in December compared with other months. In the Norwegian national health insurance system, eligibility and payment for screening do not depend on age or the timing of the test in relation to insurance coverage or previous screening examinations. Since the present analysis was not prespecified, the results should be considered as generating a hypothesis rather than as definitive. The identification and reduction of barriers to cancer screening is one way to improve attendance,²³ another is to try to identify factors that have been successful in trials with high attendance rates. Both the small Telemark Polyp Study 1 and the more recent large version of this study using flexible sigmoidoscopy had high attendance rates in Telemark (81% and 71%). For colorectal cancer screening using flexible sigmoidoscopy these attendance rates are exceptionally high compared with the population coverage in similar trials in the United Kingdom (39%) and Italy (26%)^{8,9} and in Swedish and Danish trials (30–47%).^{10,11} Whereas the Telemark Polyp Study 1 used invitations timed near birthdays, the Norwegian Colorectal Cancer

Prevention Trial 1 randomly invited adults throughout the calendar year, without taking birthdays into account.

In the present study we explored whether there might be potential for timed invitations to improve attendance at screening, and we focused on annual milestones. Two annual events that are poignant reminders of ageing are birthdays and Christmas and New Year. We did not mention age as a risk factor in the invitations, so the distribution of attendance rates in relation to birthdays suggests that appointments allocated shortly after birthdays or invitations timed for receipt in the week of a birthday have the potential to improve compliance with screening. The statistically significant higher attendance in December has limited practical implications. Screening programmes might, however, improve attendance by increasing their activity in December (for example, by running extra hours).

Attendance rates in Norwegian screening studies and timing of invitations

In contrast to the Telemark Polyp Study 1, the Norwegian Colorectal Cancer Prevention Trial 1 did not emphasise age as a risk factor in its invitations or through the media in either Oslo or Telemark. The higher attendance in Oslo when a screening appointment was given in the first or second week after a birthday or when the invitation was received in the week of a birthday is most likely due to inherent differences between an urban population (Oslo) and a mixed urban and rural population (Telemark). The findings suggest a greater potential for using age or annual milestones to improve attendance in an urban population but that to achieve high attendance in Telemark, in both the Telemark Polyp Study 1 and the Norwegian Colorectal Cancer Prevention Trial 1, factors must be sought elsewhere. Plausible explanations, although speculative, might be that those responsible for both these trials in Telemark have built up a good reputation for painless, unsedated flexible sigmoidoscopy and colonoscopies, good communication on this topic with local doctors who also provided advice on screening to their patients, and success in generating a public understanding that participation carries a potential benefit to personal health. Another reason for high attendance for flexible sigmoidoscopy in Norwegian trials may be that bowel cleansing is not required before an appointment as cleansing is by sorbitol enema administered at the screening centre on attendance.

Using age perception in active campaigning

Although increased self awareness of age may be inherently connected to annual milestones such as birthdays and Christmas and New Year, it cannot be taken for granted that a campaign to reinforce this message will improve attendance. In an Australian randomised study, framed messages on the risk, generalised risk, and relative risk of colorectal cancer failed to increase participation rates, but these messages

were not specified.¹² Reactions to information on risk factors are multifaceted when culture, context, and presentation are but some of the key elements. As high attendance is a prerequisite for the success of any screening programme, most countries implementing screening need to engage in studies on achieving high attendance rates. One strategy could be to routinely invite those eligible for screening to an appointment within one or two weeks after their birthday. Any running screening programme could easily test if the suggested strategy to improve attendance may apply to their target groups. This can be done by randomly inviting people to screening in the first or second week after their birthday compared with any other week.

Effect of small percentage variations in attendance

Birthday related screening appointments for colorectal cancer were associated with a 4.3% increase in attendance in Oslo and a 2.2% increase in Telemark. By allocating appointments in December the corresponding gain in attendance was 9.0% and 8.1%, respectively. What this may imply for a screening programme in terms of ultimate intention to treat analyses on incidence of colorectal cancer and mortality reduction may depend on the attendance rate (low, medium, high).¹³ On a scale of 0-100% for attendance, a low attendance rate will probably include a high proportion of adults at high risk of colorectal cancer because of a predisposition in the family, a high attendance rate might include the more reluctant adults at high risk because of their lifestyle, and between these two will be adults at low risk. Thus, the gains and losses in diagnosis by differences in attendance rates may vary considerably between programmes and populations, emphasising the need for more research on these variations and the ways that attendance might be improved. In the Norwegian Colorectal Cancer Prevention Trial 1, the addition of faecal occult blood testing to screening using flexible sigmoidoscopy resulted in a 4% drop in attendance, from 67% to 63%. In an intention to diagnose analysis of diagnostic gain this drop could not be compensated by a presumed higher sensitivity of the flexible sigmoidoscopy combined with faecal occult blood testing.⁶ Therefore a change in attendance rate of 3% or 4% either way may be of importance.

Generalisability of results

It has been argued that high attendance rates in trials of screening for colorectal cancer in Norway may be cultural and not easily comparable to other countries. Attendance rates for faecal occult blood testing have ranged from 52% in France to 67% in Denmark.¹⁴⁻¹⁶ The only trial of screening using faecal occult blood testing in Norway, at the time when 81% attendance was obtained for flexible sigmoidoscopy in the Telemark Polyp Study 1, had a compliance of 55%¹⁷; comparable to observations in other trials of faecal occult blood testing. This suggests that providers of screening programmes in Norway face similar barriers and facilitators for screening as other countries.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Poor compliance with cancer screening is a main barrier to successful screening programmes

Adequate measures to improve compliance of the target population are difficult to identify

Age is a major risk factor for colorectal cancer and studies have consistently shown that compliance with screening increases with age

WHAT THIS STUDY ADDS

Compliance with screening can be improved by timing appointments close to birthdays and in December

Although the reasons for this are unclear they might relate to reminders of ageing triggered by annual milestones such as birthdays

Adjusted odds ratios in the logistic regression analysis of the material from the Norwegian Colorectal Cancer Prevention Trial 1 showed that age, female sex, flexible sigmoidoscopy alone, and area of residence (Telemark in this study) remained independent determinants of attendance. These variables are known to be predictors of compliance with screening,^{8 10 11 18} thus strengthening the validity of the present findings.

Conclusion

Within the present age range of 50-64 years in the Norwegian Colorectal Cancer Prevention Trial 1 attendance increased with age. Also, attendance was higher for those receiving an invitation for screening in the week of their birthday or given an appointment for screening in the first or second week after their birthday—an effect that seemed statistically significant only to the urban population of Oslo. A higher attendance in December was observed in both populations. There might be a potential for improving compliance with screening programmes by playing on perception of ages or annual milestones. We suggest that screening programmes should consider the potential benefits of timing appointments for screening in the first or second weeks after birthdays and extending working hours in December.

Contributors: GH conceived the study and did the statistical analyses. Both authors drafted and refined the manuscript and both had full access to all data. Frøydis Langmark, director of the Cancer Registry of Norway, Oslo, is guarantor.

Funding: The Norwegian Colorectal Cancer Prevention Trial was funded by grants from the Norwegian Cancer Society and the Norwegian Department of Health. The authors are independent from the funders of that study.

Competing interests: None declared.

Ethical approval: This study was approved by the regional ethics committee. The National Institute of Data Inspection approved the study protocol of the Norwegian Colorectal Cancer Prevention Trial 1.

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Accepted: 13 October 2008