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Benefits and harms of aspirin to reduce colorectal cancer risk:

a cross-sectional study of methods to communicate risk in primary care

Abstract

Background
New Australian guidelines recommend that GPs actively consider prescribing low-dose aspirin to patients aged 50–70 years to reduce their risk of developing colorectal cancer (CRC). Patients and GPs need to understand the relative benefits and harms to support informed decision making.

Aim
To develop and examine different methods to communicate the benefits and harms of taking aspirin for CRC prevention.

Design and setting
A cross-sectional, vignette study with patients aged 50–70 years consecutively recruited from general practices in Melbourne, Australia, between July and August 2018.

Method
Summary estimates from meta-analyses of the effects of aspirin on the incidence of CRC, cardiovascular disease, gastrointestinal bleeding, and incidence rates in the Australian population to estimate outcomes in a hypothetical population of 10 000 people aged 50–70 years. These estimates were presented using four different risk communication formats. Participants were shown these different formats and asked if they would take aspirin to prevent CRC.

Results
A total of 313 participants were recruited (95.1% recruitment rate), of whom 304 completed the study. Most participants (71.7–75.3%) reported they would take aspirin irrespective of risk format presented. Bar charts (odds ratio [OR] 1.20, 95% confidence intervals [CI] = 1.01 to 1.44) and expected frequency trees (OR 1.18, 95% CI = 0.99 to 1.41) were more strongly associated with the intentions to take aspirin compared with icon arrays. Bar charts were most preferred for presenting risk information.

Conclusion
A large proportion of participants in this study intended to take aspirin to reduce their CRC risk regardless of risk communication format. Bar charts and expected frequency trees were the preferred methods to present the benefits and harms of taking aspirin to prevent CRC.

Keywords
aspirin; colorectal cancer; decision making; general practice; primary health care; risk communication.

INTRODUCTION

Australia has one of the highest rates of colorectal cancer (CRC) in the world.[1] It is the third most commonly diagnosed cancer and the second leading cause of cancer death in Australia.[2] By the age of 85 years, it is expected that 1 in 13 Australians will be diagnosed with CRC.[3]

Until recently, primary prevention of CRC has focused on modifying lifestyle and dietary behaviours associated with increased risk of CRC.[4] In 2019, Cancer Council Australia updated the *Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer* for healthcare professionals. It is recommended that people aged 50–70 years actively consider taking daily low-dose aspirin (100 to 300 mg) to reduce their risk of developing CRC.[5] The guidelines were based on evidence from recent meta-analyses of trials of aspirin, originally designed to examine cardiovascular outcomes, but re-analysed to look at cancer incidence and mortality.[6,7] The recommendation proposes low-dose aspirin is taken for at least 2.5 years,[5] recognising that the benefits of aspirin on reduction in CRC incidence are not observed until after 10 years.[7] The guideline recommendations were based on evidence that the overall benefits of low-dose aspirin, in terms of reducing CRC and cardiovascular disease, significantly outweigh potential harms, specifically from gastrointestinal (GI) bleeding. The guidelines have been endorsed by the National Health and Medical Research Council, and the Royal Australian College of General Practitioners *Red Book* (9th edition), a guideline on preventive care in general practice for GPs, has also been updated to reflect these new recommendations.[8]

To facilitate the implementation of these guidelines, clinicians need to be able to present the relative benefits and harms of taking aspirin so that patients can make an informed decision about whether they should take aspirin.[9] There is no agreed best method of risk communication to allow patients to understand the potential consequences of treatment, the size of potential benefit, and potential associated harms of treatment.[10,11] In this article the authors report the development and evaluation of different risk communication formats that present the harms and benefits of aspirin for CRC prevention in a general practice patient population.

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How this fits in

Australian guidelines now recommend that people aged 50–70 years consider taking low-dose aspirin to prevent colorectal cancer. There are various clinical benefits and potential harms from taking aspirin that need to be considered by patients to ensure that they make an informed decision about taking aspirin. The authors have developed and tested four different risk communication methods with patients from general practice. Expected frequency trees and bar charts were the preferred methods, and were more strongly associated with intentions to consider taking aspirin, though >70% of participants said that they would take aspirin regardless of risk communication format.

METHOD

Development of estimates for the benefits and harms of low-dose aspirin in the Australian population and risk formats

The authors estimated clinical outcomes of taking low-dose aspirin for 5 years in hypothetical Australian populations of males and females aged 50–70 years, using current age distributions from the Australian Bureau of Statistics, 2016.[12] Clinical outcomes of relevance included CRC, myocardial infarctions, ischaemic and haemorrhagic stroke, and GI bleeding over a 10-year period. The estimated 10-year incidences are also available (Supplementary Table 1). Australian baseline incidence rates were calculated using data from the Australian Institute of Health and Welfare, and Australian Government Productivity Commission.[3,13,14] Published summary statistics of effect size from the meta-analyses of low-dose aspirin were used to estimate absolute event rates per 10 000 people.[15] Published statistics to estimate baseline incidence rates for GI bleeding were used as there were no publicly made available data for the Australian population.

In this study, four different risk communication formats were developed and, where relevant, the aforementioned risk estimates of clinical outcomes were incorporated. Specific risk communication formats for males and females were created to account for different incidence rates of the clinical outcomes of interest. The risk communication formats included: an icon array, expected frequency tree (EFT), bar chart, and a statement including the Australian Government and Cancer Council Australia recommendation, and an absolute lifetime risk of CRC ('1 in 11 men'). Figure 1 shows the four format types for males; formats for females are also available (Supplementary Figure 1). The selection and design of the four risk communication formats was informed by recommendations on presenting risk information and commonly used methods of risk communication in the existing literature.[11,16] These were designed by a graphic design expert, with iterations made in consultation with researchers experienced in patient risk communication, before the evaluation phase.

Evaluation method

A cross-sectional, vignette study was conducted with patients from two general practice clinic waiting rooms between July and August 2018 in Melbourne, Australia. Participants were eligible for the study if they had an appointment with their GP and were aged 50–70 years to be consistent with the age group in the Australian guidelines.[5,8] Patients were excluded if they had a previous CRC diagnosis, any contraindications to taking aspirin including aspirin allergy, severe visual or hearing impairment, severe intellectual disability or psychiatric illness, were too unwell, or were unable to read and understand English.

Participants entered brief demographic information and current aspirin use on an iPad, and were then shown four different screens presenting each of the different risk communication formats designed for the study in random order. For each screen, participants were asked to select one of the following options as to whether they would take aspirin to reduce their risk of 'bowel cancer':

- *'Yes, I would take aspirin to reduce my risk of bowel cancer'*; or
- *'No, I would not take aspirin to reduce my risk of bowel cancer.'*

Participants had to choose an option to move on to the next screen. At the end of the survey participants were asked to select the risk communication format they preferred.

Statistical analysis

Multivariable logistic regression analyses using the survey command in Stata (version 15.1) were used to examine the association between the different risk communication formats and the intention to take aspirin to reduce CRC risk. The icon array was used as the reference point as this is a commonly

Figure 1. Estimated 10-year incidence of bowel cancer, myocardial infarction, stroke, and bleeding from stomach and gut when taking low-dose aspirin for 5 years in 10 000 Australian males aged 50–70 years, presented as an icon array. Some people may experience one, none, or multiple listed side effects.

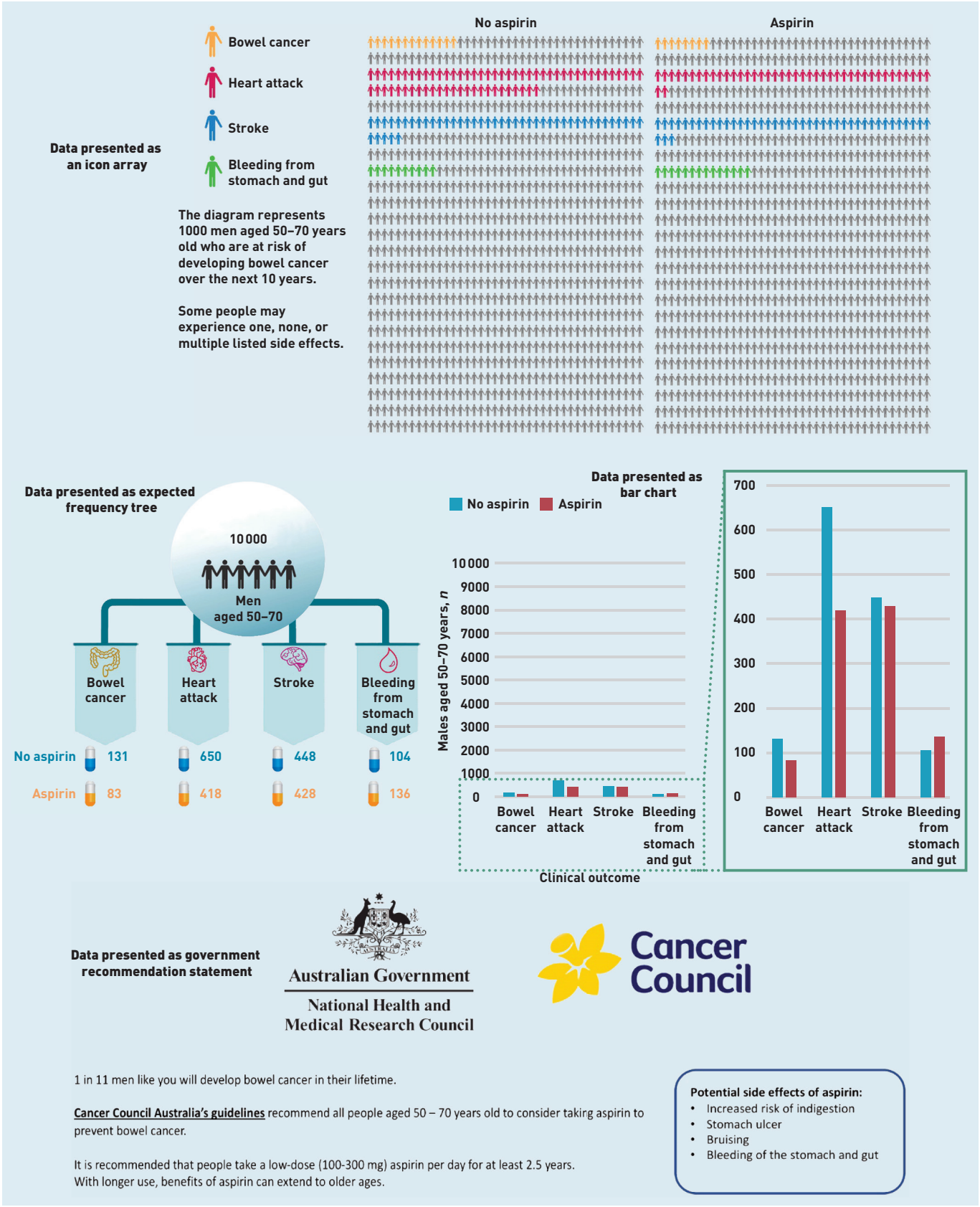

Figure 2. Recruitment flow diagram showing the number of patients and rates at each stage of the recruitment process. CRC = colorectal cancer.

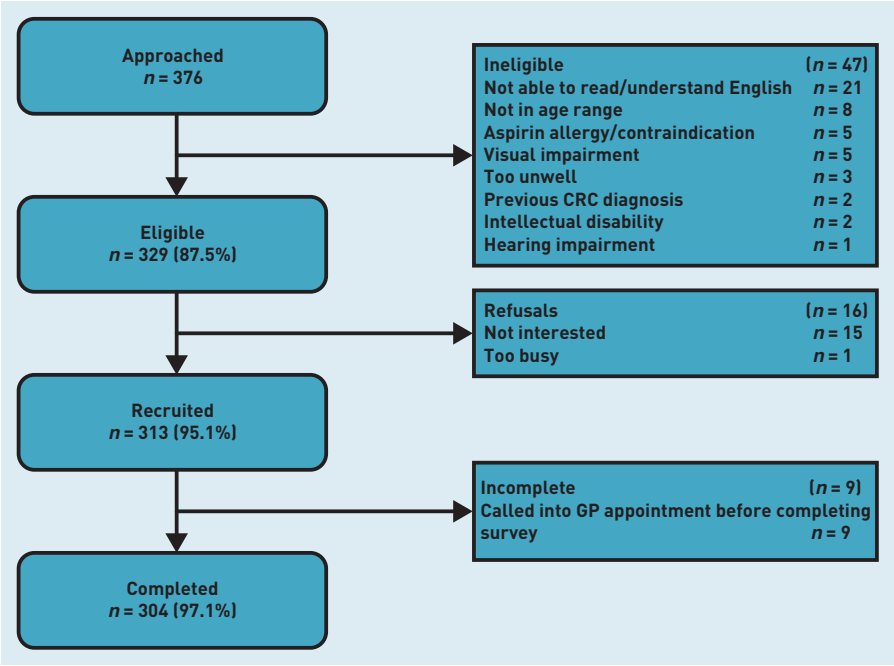

Table 1. Summary of participant characteristics, and comparison with Australian population aged 50–70 years

Characteristic	Participants (*N* = 304) *n* (%)	General population aged 50–70 years, %
Sex		
Male	116 (38.2)	48.2
Female	188 (61.8)	51.8
Age, years		
50–54	75 (24.7)	28.3
55–59	90 (29.6)	25.9
60–64	64 (21.1)	22.4
65–70	75 (24.7)	23.4
Country of birth		
Australia	221 (72.7)	55.8
Other	83 (27.3)	44.2
Language spoken at home		
English	279 (91.8)	69.2
Other	25 (8.2)	30.8
Education attained		
Never completed high school	50 (16.5)	30.9
Completed high school only	94 (30.9)	14.8
TAFE or similar	90 (29.6)	27.7
University degree or higher	70 (23.0)	26.6
Family history of CRC		
Yes	68 (22.4)	n/a
No	236 (77.6)	
Current aspirin use		
Yes	49 (16.1)	n/a
No	255 (83.9)	
Number of different prescription medications		
0	94 (30.9)	n/a
1–3	139 (45.7)	
≥4	71 (23.4)	

CRC = colorectal cancer. TAFE = technical and further education.

used risk communication format in patient decision aids.[17]

RESULTS

Out of 376 people who were approached, 329 were eligible and 313 were recruited for the study (95.1% recruitment). Of the 313 who participated, 304 people completed the study (97.1%) (Figure 2). The final dataset did not include data from participants who ran out of time to complete their responses (*n* = 9).

Table 1 presents data on the participant characteristics, and comparable data for the Australian population. More females than males were recruited into the study (*n* = 188, 61.8%), more people aged between 55 and 59 years with a mean age of 59.4 years, and a higher proportion had completed high school than the average Australian population. Most participants did not have a known family history of CRC (*n* = 236, 77.6%) and 16.1% (*n* = 49) reported taking regular aspirin at the time of recruitment.

Table 2 presents data on intentions to take aspirin by risk communication format. Over 70% of participants said they would take aspirin to reduce their risk of bowel cancer regardless of risk communication format.

Table 3 presents the odds ratios (OR) for intention to take aspirin for each risk communication format, relative to the icon array. Bar charts and EFTs were associated with higher point estimates of the odds to take aspirin; the bar chart was statistically

Table 2. Proportion of patients with the intention to take aspirin by risk format, *N* = 304

Risk presentation format	Intention to take aspirin *n* (%)	No intention to take aspirin *n* (%)
Bar chart	229 (75.3)	75 (24.7)
Expected frequency tree	228 (75.0)	76 (25.0)
Government statement	220 (72.4)	84 (27.6)
Icon array	218 (71.7)	86 (28.3)

Table 3. Associations between risk formats and the intention to take aspirin using multivariable logistic regression

Predictor	OR (95% CI)	*P-value*	aOR[a] (95% CI)	*P*-value
Risk format				
Icon array	Ref		Ref	
Government statement	1.03 (0.86 to 1.25)	0.73	1.04 (0.85 to 1.26)	0.73
Expected frequency tree	1.18 (0.99 to 1.41)	0.06	1.19 (0.99 to 1.44)	0.06
Bar chart	1.20 (1.01 to 1.44)	0.04	1.22 (1.01 to 1.47)	0.04

[a]Adjusted odds ratio were adjusted for aspirin use, family history of CRC, education attained, and age.
aOR = adjusted odds ratio. CI = confidence interval. OR = odds ratio. Ref = reference group.

Table 4. Participant preferences for each of the four risk formats

Risk format	Participants[a] *n* (%)
Bar chart	108 (39.1)
Expected frequency tree	82 (29.7)
Icon array	32 (11.6)
Government statement	25 (9.1)
None of the above	29 (10.5)

[a]Some participants did not complete this survey question: n = 28 (9.2%).

significantly associated with greater odds to take aspirin compared with the icon array (unadjusted OR 1.20, 95% CI = 1.01 to 1.44). People who reported current aspirin use were more likely to intend to take aspirin to reduce CRC risk ($P<0.001$) (Supplementary Tables 2 and 3). The overall findings were similar when adjusting for aspirin use, family history of CRC, education, and age (Table 3).

Table 4 presents data on participants' preferences for the risk communication formats, showing that bar charts and EFTs were the most preferred.

DISCUSSION

Summary

To the authors' knowledge, this is the first study to develop and explore different methods of presenting the harms and benefits of aspirin as a risk-reducing medication for CRC in primary care. Overall there were relatively high levels of intention to take aspirin irrespective of the type of risk communication used. Bar charts and EFTs were the preferred risk communication formats and were both associated with higher intentions to take aspirin.

Strengths and limitations

Patients were recruited consecutively from general practice, with high accrual rates, and were generally representative of a population attending primary care.[18] The authors presented risk communication formats in a random order to reduce any potential ordering effect on responses.

Limitations include the hypothetical nature of the study, which used intentions to take aspirin as the primary outcome. Participants' intentions may not reflect their future behaviours given the well-recognised gap between intention and behaviour.[19] Intentions and behaviours are only one aspect of informed decision making, and the authors did not examine participants' understanding or attitudes about taking aspirin.

Data from participants who did not complete all screens were excluded from the analyses. The main reason for this was that patients were called in for their consultation before they could complete the questions, rather than unfamiliarity with an iPad, even in older patients.

In developing estimates of benefit, the authors applied the larger 37% risk reduction on CRC incidence seen on higher doses of aspirin. It may have been appropriate to use the more conservative estimates of 25% reduction in CRC incidence as the summary estimate for lower doses of aspirin.[7] For males, this would mean that, instead of 83 males on aspirin developing CRC, 99 males would. It is difficult to know how much this would have altered participant responses.

Given this was, to the authors' knowledge, the first study of its kind, the sample size was pragmatically based. Based on the observed rates of intentions to take aspirin, the authors had limited power to detect small differences in intention to take aspirin between risk communication formats.

Comparison with existing literature

There is extensive literature on methods of risk communication in health care.[20] This has led to various recommendations about appropriate design and approaches used in patient decision aids.[11,17,21–27]

Visual representation of risk information has been shown to increase the accuracy of risk comprehension and improve decision making for patients.[11,17] Previous studies have identified conflicting evidence regarding the influence of icon arrays on improving risk comprehension (Minshall *et al*, unpublished data, 2018).[17,23] They have been widely explored in the existing literature and are commonly used to present risk information.[17] In the present study, participants preferred alternative risk communication formats such as bar charts and EFTs, both of which were associated with higher intentions to take aspirin than the icon arrays. One of the challenges with icon arrays is using a single

array to present multiple outcomes, which can be potentially confusing to users.

Using expected frequency trees is a newer method to present absolute risks and multiple outcomes, which may be a clearer method to explain harms and benefits than a single icon array. Their main potential disadvantage is that they fail to present visually the size of the denominator population, which may be particularly relevant when presenting relatively rare events.

Bar charts have also been suggested as an appropriate graphical method for presenting risk information.[11] To highlight the differences between taking and not taking aspirin, the researchers presented the complete bar chart with 10 000 as the maximum on the *y*-axis and magnified the harms and benefits to make the comparisons more legible. This also demonstrates the difficulties of visually displaying rare events such as CRC in a population and might have inadvertently led participants to overestimate the effect of aspirin, both negative and positive.

The present study also tested a simpler recommendation endorsed by a government agency and a well-respected cancer charity. This also presented basic information about side effects but without detailing the magnitude. This was least preferred and was not associated with intention to take aspirin compared with the icon array. A previous study had suggested this was a potentially useful approach in CRC screening, but the authors failed to replicate this in the present study.[23]

Implications for research and practice

This study provides the foundations to support informed decision making about aspirin and CRC prevention in primary care. Although the aim of this study was to compare methods of presenting risk information about aspirin, a large proportion of participants intended to take aspirin to reduce CRC risk regardless of the risk presentation shown. This may reflect familiarity with aspirin and its high level of acceptance. Where aspirin is perceived as a relatively low-risk drug, people are prepared to tolerate the risks associated from taking aspirin to secure certain benefits, particularly for a condition as serious as CRC. This study could make a stronger case for ensuring that individuals are aware of the size of benefits and potential harms from taking regular aspirin for disease prevention.

There is no 'one size fits all' approach to risk communication and it is important to test different approaches when developing aids for a new area of clinical decision making.[22] Novel methods of presenting risk information, such as EFTs, may provide accurate, more easily understood risk information compared with established formats such as icon arrays. The researchers tested a variety of formats presented directly to patients on an iPad and do not know the impact of using such tools when communicated within a consultation. Future research should trial these methods of communicating the risks and benefits, potentially within a GP consultation, and their effect on actual aspirin use and measures of informed decision making. In the longer term, the real-world implementation of these new guidelines recommending aspirin and their effects on CRC incidence, mortality, and other relevant clinical outcomes should be monitored.

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Ethical approval

This research was approved by the Human Ethics Advisory Group at the Department of General Practice, University of Melbourne (ethics approval ID 1851664.1).

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

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