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Development, implementation and yield of a cardiometabolic health check

Merijn B Godefrooij[a,*], Rolf M van de Kerkhof[b], Paul J Wouda[b], Robert A Vening[c], J André Knottnerus[a], Geert-Jan Dinant[a] and Mark G Spigt[a]

[a]CAPHRI—School for Public Health and Primary Care, Department of General Practice, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, [b]Woensel Primary Health Care Centre and [c]Department of Research and Development, Eindhoven Corporation of Primary Health Care Centres, Eindhoven, The Netherlands.
*Correspondence to Merijn B. Godefrooij, CAPHRI - School for Public Health and Primary Care, Department of General Practice, Faculty of Health, Medicine and Life Sciences, Maastricht University, PO Box 616, 6200 MD Maastricht, The Netherlands; E-mail: merijn.godefrooij@maastrichtuniversity.nl

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Background. Cardiometabolic health checks are currently introduced in several countries in an attempt to reduce the population-wide increase of cardiometabolic disease.

Objective. Developing and implementing a health check for cardiometabolic disorders in a medium-sized primary health care centre and describing the participation rate and the numbers of disorders requiring treatment that are identified.

Methods. Observational research in Eindhoven, The Netherlands. All registered patients aged 40–75 years without known cardiometabolic disease (i.e. cardiovascular diseases, diabetes and chronic kidney disease) (n = 1704) were sent a written invitation to participate in a health check. A three-step procedure was used to determine whether a participant was at increased risk of developing cardiometabolic disease. Treatment was started if necessary, according to current guidelines. We recorded the numbers of patients proceeding through each step and the numbers of disorders identified.

Results. A total of 1270 patients (75%) returned the first screening questionnaire. Based on the information from this questionnaire, 952 were invited to visit the health care centre for further assessment. A total of 145 patients (11% of the 1270) were found to have at least one disorder for which treatment was indicated (e.g. increased cardiovascular risk, isolated systolic hypertension, diabetes mellitus, suspected familial hypercholesterolaemia or kidney disease).

Conclusions. The response rate and the number of cases identified demonstrate that cardiometabolic disorders can be effectively detected at a primary health care centre. Further research is needed to assess the long-term effects and efficacy of health checks in general practice.

Keywords. Cardiovascular diseases, diabetes mellitus, mass screening, primary prevention, renal insufficiency.

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Introduction

Western health care systems are confronted with the increasing pressure of chronic disease. Rising medical costs and new models of care for the chronically ill demand new ways of organizing and financing health care[1] and are calling for reform. This has resulted in a gradual paradigm shift in medical care from purely curative and demand-driven care towards offering a form of health care that also includes various types of prevention.[2] Contributing factors are the development and refinement of risk prediction models[3,4] and an increasing interest in prevention in politics and public life.[5–7] These developments, however, do not necessarily imply that prevention is by definition successful.[8]

Because of their central and coordinating role in most health care systems, GPs are closely involved in these developments. They are challenged to shift their focus of care from individuals to populations and to cooperate with other caregivers in the organization and delivery of care for the chronically ill.[9]

Cardiometabolic diseases (i.e. cardiovascular disease, diabetes mellitus and chronic kidney disease) are amongst the leading causes of morbidity and mortality worldwide.[10] The high prevalence of complications at the time of diagnosis makes early detection

and preventive treatment desirable. Consultations at the general practice may provide a good opportunity to identify and preventively treat individuals with an elevated cardiometabolic risk.

A number of studies have evaluated the effect and feasibility of primary prevention of cardiovascular diseases in primary care, such as the British Family Heart Study,[11] the OXCHECK study[12] and the Dutch Nijmegen Intervention Project.[13] These studies found that it was difficult for both care providers and patients to keep up the preventive efforts over longer periods of time, even though this is essential to improve patient health. In view of recent developments, including the wide availability of tools for health risk appraisal,[14] the creation of multidisciplinary care programmes for chronic diseases, the introduction of practice nurses in general practices[15] and recent guidelines on health checks for cardiometabolic disease,[5] the time is right to review the possibilities for the prevention of cardiometabolic disorders in primary care.

We therefore implemented a cardiometabolic health check among persons aged 40–75 years in five Dutch general practices. Our study tried to answer the following questions: (i) Is it feasible to design and implement a cardiometabolic health check in a medium-sized primary health care centre? (ii) How many patients will participate in the consultations and how many disorders requiring treatment will be identified?

Methods

Setting

The health checks took place between November 2008 and June 2009 in five GP practices that care for a population of about 7100 patients. All five practices are part of the Woensel Primary Health Care Centre in the town of Eindhoven (estimated population 214 000), The Netherlands. The centre is part of the Eindhoven Corporation of Primary Health Care Centres.

Inclusion

We included all patients aged between 40 and 75 years that were registered with one of the five participating GP practices. We excluded patients if their electronic medical records (EMRs) contained a history any of the following diseases, based on the International Classification of Primary Care (ICPC) codes: angina pectoris (K74), myocardial infarction (K75), heart failure (K77), hypertension (K86/87), cerebrovascular accident/transient ischemic attack (K89/90), diabetes mellitus (T90), hypercholesterolaemia (T93) and peripheral arterial disease (K92). Patients were also excluded if they were currently using any of the following medication, based on categories from the Anatomical Therapeutic Chemical classification: anti-hypertensives (B01/C01/02/03/07/08/09), anti-lipidemics (C10) or anti-diabetics (A10). We included a total of 1704 patients, who were all sent an invitation letter on behalf of their GP to participate in the health check. The back of the letter, which came with a stamped and addressed return envelope, contained a screening questionnaire. No reminders were sent.

Screening questionnaire

Since no validated screening questionnaire for the integrated risk estimation of cardiometabolic diseases was available at the beginning of our study, we developed one ourselves. The questionnaire items were based on current guidelines for cardiometabolic disorders and on validated instruments like the FINDRISK questionnaire, the SCORE risk chart and a prediction model for peripheral arterial disease.[3,16–19] Each of the questionnaire items was allocated a range of scores (Table 1), based on the instruments referred to above and on consensus discussions between the GPs and researchers about the categories of patients that should definitely consult their GP for further risk assessment.

A questionnaire score of 7 or more resulted in the patient being invited to consult their GP. Patients who failed to respond to this invitation received a reminder by phone. Patients with a score below the cut-off value of 7 were sent a letter saying that their risk was probably normal and offering a number of general lifestyle recommendations.

First consultation

The first consultation was carried out by the practice assistant (a medical receptionist) and consisted of a number of standardized questions and simple measurements (blood pressure, height, weight and waist circumference). After this consultation, patients were given a test ordering form, which they took to the laboratory to have a number of tests done: fasting glucose, fasting lipid profile, creatinine concentration, estimated creatinine clearance ('modification of diet in renal disease') and a proteinuria test. These test results were supplemented with relevant medical data from the patients' EMRs, as well as with data on health care consumption, socio-economic status and ethnicity.

The results of the consultation were analyzed by a practice nurse. Patients were sent their results in writing if their SCORE risk was not elevated (0–4%) and none of the following disorders had been found: isolated hypertension (≥180/130 mmHg), abnormal fasting glucose concentration (≥6.1 mmol/l), elevated fasting cholesterol concentration (≥8 mmol/l), cholesterol/high-density lipoprotein ratio (≥8) or low-density lipoprotein cholesterol concentration (≥5 mmol/l), decreased creatinine clearance (<60 ml/min/1.73 m^2)

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TABLE 1 *Cardiovascular risk screening questionnaire and corresponding score values*

Item + question	Answering options	Score[a]	Respondents, n = 1270 (%)
1. Age	Younger than 45	0	307 (24.2)
Calculated from date of birth	45–49	1	290 (22.8)
	50–54	2	188 (14.8)
	55–59	3	136 (10.7)
	60–64	4	155 (12.2)
	65 and over	5	194 (15.3)
2. Body mass index	Below 25	0	626 (49.3)
What is your height?	25–29.99	2	503 (39.6)
What is your weight?	30–34.99	5	119 (9.4)
	35 and above	7	22 (1.7)
3. Smoking	Never smoked	0	548 (43.1)
Do you smoke?	Given up, used to smoke occasionally	1	79 (6.2)
	Given up >10 years ago, used to smoke daily	2	234 (18.4)
	Occasional smoker	3	65 (5.1)
	Given up recently, used to smoke daily	4	91 (7.2)
	Daily smoker	5	253 (19.9)
4. Physical activity	>4 times a week	0	298 (23.5)
How often do you engage in physical activity for at least 30 minutes in such a way that your heart rate and your breathing go up (e.g. brisk walking, cycling at normal speed)?	3–4 times a week	1	277 (21.8)
	1–2 times a week	3	452 (35.5)
	Never	4	243 (19.1)
5. Cardiovascular disease in first-degree relative <60 years	No	0	861 (67.8)
Does/did your father, mother, brother or sister have a cardiovascular disease before the age of 60? (cardiovascular disease includes among others heart attack, cerebral infarction, cerebrovascular accident, stroke, narrowed arteries, intermittent claudication, percutaneous coronary intervention treatment)	Yes	7	409 (32.2)
6. Diabetes mellitus in first-degree relative	No	0	988 (77.8)
Does your father, mother, brother or sister have diabetes?	Yes	4	282 (22.2)
7. Gestational diabetes	No	0	676 (53.2)
Have you ever had gestational diabetes?	Yes	7	12 (0.9)
	Not applicable	0	582 (45.8)

[a]The score ranges were based on current guidelines for cardiometabolic disorders,[16,17] validated risk calculation tools[3,18,19] and consensus decisions between participating GPs and researchers.

or albuminuria (⩾30 mg/l). This letter also offered general lifestyle recommendations. In all other cases, patients received a letter inviting them for a follow-up consultation.

Follow-up consultation

The follow-up consultation was carried out by a practice nurse, who measured blood pressure once more, and had the laboratory tests with abnormal results repeated. Based on the new test results, patients were given individual lifestyle recommendations. Where necessary, a treatment plan was established or the patient was referred to their own GP for further examinations or treatment, in accordance with the prevailing guidelines. The treatment and referral indications used are listed in Table 2.

Data processing

All analyses were carried out in SPSS 16.0 (SPSS Inc., Chicago, IL). We tested the differences between those who returned the questionnaire and those who failed to do so using a Chi-squared test or a t-test, and we calculated 95% confidence intervals for all outcomes of the health check.[20]

Ethical approval

No ethical approval was required since the health checks were an initiative of the care providers at the Woensel Primary Health Care Centre in the context of an improvement programme for usual care. The scientific use of anonymized medical data extracted from EMRs does not require ethical review in The Netherlands. No government license was required for the health check

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TABLE 2 *Treatment and referral indications detected in patients participating in a cardiometabolic health check in the town of Eindhoven, The Netherlands, between November 2008 and June 2009*

Indication	*n* (95% CI)	% of respondents (*n* = 1270)	% of participants taking part in first consultation (*n* = 681)	Participants/disorder discovered[a]
Risk according to SCORE risk chart ⩾10%	42 (30–57)	3.3	6.2	16.1
Risk according to SCORE risk chart 5–9% with additional risk factor[b]	77 (61–96)	6.1	11.3	8.8
Two times blood pressure ⩾180 (mmHg)	13 (7–22)	1.0	1.9	52.6
Two times fasting glucose ⩾7 (mmol/l)	11 (5–20)	0.9	1.6	62.5
Two times total cholesterol or cholesterol/high-density lipoprotein ratio ⩾8 (mmol/l)	3 (1–9)	0.2	0.4	250
Two times low-density lipoprotein cholesterol ⩾5 (mmol/l)	9 (4–17)	0.7	1.3	76.9
Two times macro-albuminuria[c]	0 (0–3)	0	0	∞
Creatinine clearance <60 in patient <65 years (ml/min/1.73 m^2)	7 (3–14)	0.6	1.0	100
Total[d]	145 (122–171)	11.4	21.3	4.7

CI, confidence interval.
[a]Numbers of participants that have to be assessed by a doctor or paramedic to find one abnormal result. Calculation based on the 681 participants who attended the first consultation.
[b]Additional risk factor: family history of cardiovascular disease, obesity (body mass index > 30 or waist circumference > 88 cm for women or > 102 cm for men) or signs of end organ damage (albuminuria or renal impairment).
[c]Albumin/creatinine ratio > 25 mg/mmol for men or > 35 mg/mmol for women.
[d]Number of participants with one or more abnormal results.

TABLE 3 *Prevalence of cardiometabolic disorders in participating GP practices before the start of the present study, compared to prevalences of the same disorders in the RNH register: a register of GP data based on a cohort of over 80,000 patients in the Dutch province of Limburg*[21]

ICPC code	Definition	Total practice population (*N* = 7087)[a]		RNH register[b]
		n	/1000	/1000
K74	Ischaemic heart disease with angina	210	30	30
K75	Acute myocardial infarction	176	25	24
K77	Heart failure	88	12	8
K86	Hypertension, uncomplicated	838	118	82
K87	Hypertension, complicated	188	27	12
K89	Transient cerebral ischaemia	85	12	10
K90	Stroke/cerebrovascular accident	141	20	16
K92	Atherosclerosis/peripheral vascular disease	158	22	15
T90	Diabetes mellitus	498	70	48
T93	Lipid disorder	377	53	45

[a]Data for 2008.
[b]Data for 2004.

according to Dutch screening legislation (Wet Bevolkingsonderzoek: Law for Population Screening).

Results

Patient flow

Table 3 lists the prevalence of a number of cardiometabolic disorders in the participating GP practices prior to the health checks, based on the ICPC codes registered in the problem lists of the EMRs. For the sake of comparison, the table also shows the prevalence data for these same ICPC codes available from the Registratienetwerk Huisartsenpraktijken (RNH) register: a register of GP data based on a cohort of over 80 000 patients registered at 65 GP practices in the Dutch province of Limburg, all of which use similar registration systems.[21]

Figure 1 shows the patient flow through the steps of the health check programme.

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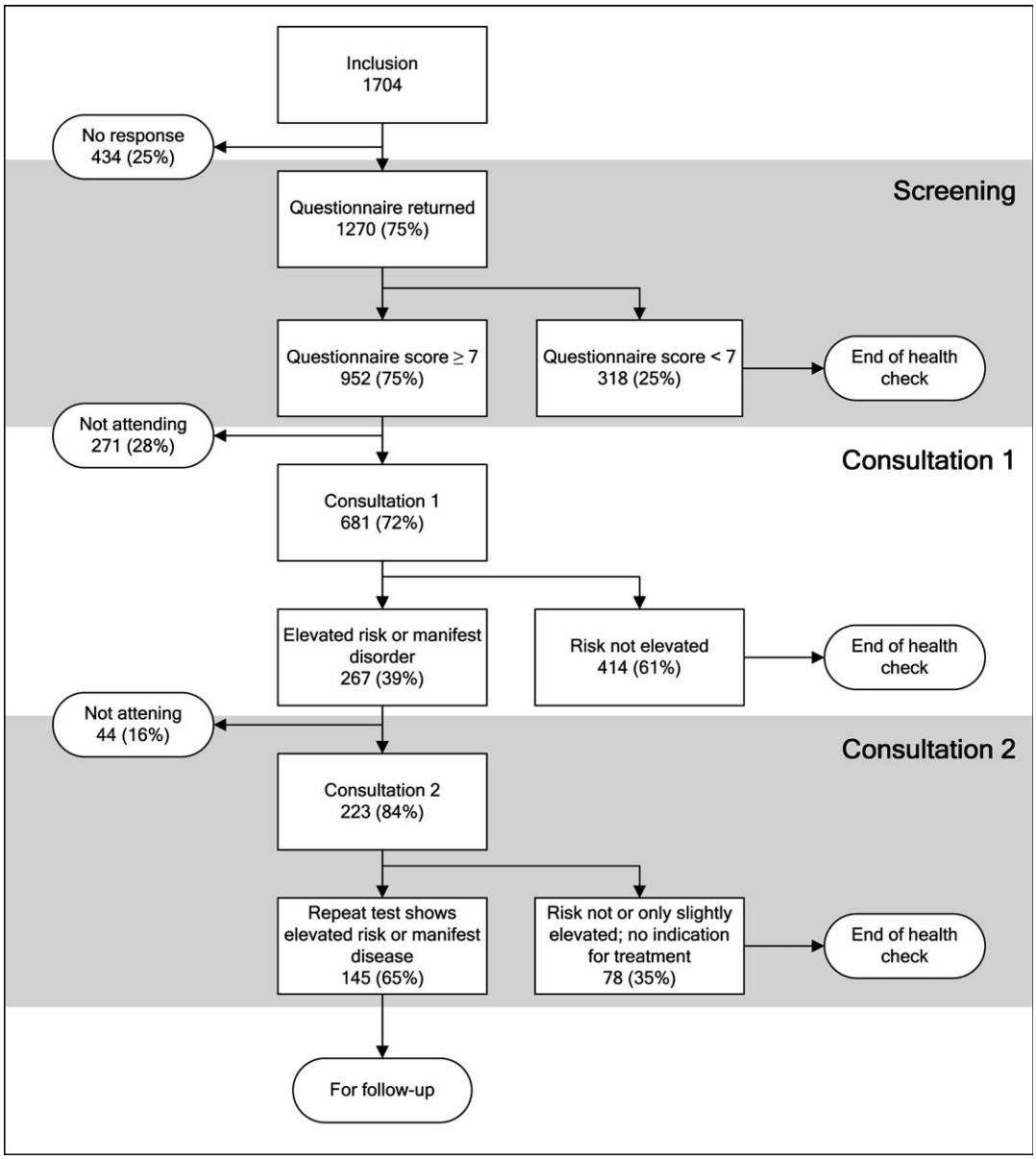

FIGURE 1 *Flow diagram of patients aged 40–75 years from a medium-sized primary health care center who were invited to take part in a study of the value of a cardiometabolic health check*

TABLE 4 *Baseline characteristics of study population and specified for responders and non-responders*

Characteristic	Total (n = 1704)	Responders (n = 1270)	Non-responders (n = 434)	P value
Mean age in years	51.9	52.7	49.5	<0.001
Sex (% of women)	52.1	54.2	46.1	0.004
Health care consumption (mean number of consultations/year)	3.7	3.9	3.3	0.003
Mean SES score[a]	0.31	0.28	0.40	0.018
Ethnicity (% Western)	87.7	89.6	82.3	<0.001

SES, socioeconomic status. All data were anonymously extracted from the EMRs.
[a]Socioeconomic status, as calculated by the Dutch National Institute for Public Health and Environment, based on the postal codes of patients.[22] The SES score is a deprivation score; a high value corresponds to low SES and vice versa.

Study population

Table 4 presents a number of basic characteristics of the study population. It shows that the 1270 responders were, on average, older and more likely to be female than the non-responders and had a higher health care consumption and a higher socio-economic

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status. Patients of Western ethnicity were more likely to return the questionnaire than those of non-Western origin.

Outcomes

Fifty-one per cent of the respondents were overweight (body mass index $\geqslant 25$) (see Table 1), and 25% were active smokers. One in three of the patients (32%) had a family history of cardiovascular diseases and 22% had a family history of diabetes. Twelve of the 688 female respondents (2%) had a history of gestational diabetes.

The repeat tests showed the presence of one or more disorders for which treatment was indicated in 145 of the patients (see Table 2). The most commonly found disorder (9.4% in total) was an increased risk according to the SCORE assessment. The numbers of patients identified with other disorders were always between 0 and 1% of the study population. The table shows the outcomes not only as a percentage of the total number of participants but also as a percentage of the total number of people examined at the GP practice. The latter percentage was used to calculate the number of persons a doctor or paramedical professional would need to assess to encounter one disorder (see Table 2). The results show that disorders for which treatment is indicated were identified in an average of one in five of those attending the first consultation at the GP practice.

The practice nurses referred 78 of the 145 patients thus identified to the GP for further diagnostics and treatment. Twenty-five of them eventually started pharmacological treatment, while 7 were referred to secondary health care based on the outcome of their health check.

Discussion

Summary of main findings

Our experiences show that it was feasible to design and implement a cardiometabolic health check in a medium-sized primary health care centre. Almost 75% of the patients we contacted returned the screening questionnaire. Eventually, one or more disorders for which treatment is indicated under the current Dutch guidelines were found in 145 respondents, corresponding to 11% of all participants and 21% of the 681 patients who attended the first consultation.

Strengths and limitations of the study

When we designed our study, there was no validated instrument for integrated cardiometabolic risk screening, so we designed one ourselves. We deliberately chose a low cut-off value for the present study to facilitate future validation studies for the questionnaire. Had we raised the cut-off value to 10, we would still have identified 122 out of the currently identified 145 persons with one or more indications for treatment. The total number of patients that would have been invited for a consultation would then have been only 691 (55% of the 1270 who were invited using a cut-off value of 7). In view of the small number of high-risk patients in the group with a questionnaire score of 7–9, it seems unlikely that many high-risk patients were missed in the group scoring below 7. The validity of the screening questionnaire we developed will be assessed in a separate study.

A limitation of our study was that all results were obtained from the GP practices in one primary health care centre. Further studies will have to examine whether our findings have more general validity. Since the prevalence values for cardiometabolic disorders we found in our study population prior to the intervention are comparable to those in the RNH register (see Table 3), it seems unlikely that the number of cases we identified deviates greatly from the prevalence figures in other urban GP practices.

Practical implications and comparison with existing literature

Literature speaks of a so-called 'healthy screenee effect'[23]: the phenomenon that healthy, well educated, affluent people with considerable health awareness show a greater tendency to participate in health screening programmes than those with a low educational level, low socio-economic status or an unhealthy lifestyle. Another term that is used for this group of healthy respondents is the 'worried well'.[24] This phenomenon was also evident in our target population (see Table 4). The implication of this is that our intervention may have failed in reaching those at highest risk for developing cardiometabolic disease and as a consequence may have helped to increase instead of decrease the gap of health inequalities. On the other hand, it may be easier to reach this high-risk group after a population-based health check. The 'unknown health status' group has been reduced to only those who did not participate in the initial screening, making it easier to pay attention to these non-responders in subsequent regular care consultations.

The health check we conducted demonstrates that GPs can play a central and coordinating role in the execution of a community-oriented screening programme, with the support of their team of practice nurses and assistants. The overall yield of the health check was relatively high, with one in every five patients attending the practice consultations being identified at high risk. Other research has demonstrated that the integration of general practice with proactive population management and team-based care (which challenges the traditional model of patient-oriented, demand-driven care in many respects) can present great challenges for

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GPs.[25] The fact that our health check had a well-defined goal and workflow may have helped in this respect.

Although our findings suggest that the programme is effective in identifying persons at risk, some critical comments have to be made about the wider introduction of cardiometabolic health checks in primary care. Firstly, political and social developments often outpace scientific developments. Although the idea of population-level prevention programmes sounds attractive, there is still no conclusive evidence that early lifestyle interventions actually result in significantly reduced morbidity or mortality from cardiovascular diseases. According to a recent Cochrane review, the effects multiple risk factor interventions are not always consistent and are heterogeneous amongst different studies.[8] The evidence of the effect of such interventions appears to be the greatest in the identification and treatment of high-risk groups. Secondly, although methods to estimate the risk of developing cardiometabolic disorders are becoming ever more accurate through the development of new risk prediction models, the challenge remains to translate these population risk rates into a personal risk.[26] This is one of the reasons why screening will always lead to medicalization of a group of people who are not (or not yet) ill with all possible side-effects.[27] Finally, the current debate on screening seems to suggest that health can be 'created' and that there is an absolute causal relationship between a healthy lifestyle and the risk of developing diseases. This can—at best—be only partially true.

Conclusions and suggestions for future research

Our study represents an initial step in the assessment of the value of cardiometabolic health checks in primary care. The results show that it is feasible to identify people at increased risk of cardiometabolic disorders in a medium-sized primary health care centre. However, merely identifying high-risk groups does not change their risk. A thorough assessment of the long-term effects and efficacy of cardiometabolic health checks will require randomized studies that go beyond the identification stage.

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