

Systematic Review

Barriers and facilitators among health professionals in primary care to prevention of cardiometabolic diseases: A systematic review

Per E Wändell^a, Anne-Karien M de Waard^b, Martin J Holzmann^c,
Carl Gornitzki^d, Christos Lionis^e, Niek de Wit^b, Jens Søndergaard^f,
Anders L Sønderlund^f, Norbert Kral^g, Bohumil Seifert^g, Joke C Korevaar^h,
François G Schellevis^{h,i} and Axel C Carlsson^{a,j}

^aDivision of Family Medicine and Primary Care, Department of Neurobiology, Care Science and Society, Karolinska Institutet, Huddinge, Sweden, ^bJulius Center for Health Sciences and Primary Care, University medical Center, Utrecht, The Netherlands, ^cFunctional Area of Emergency Medicine, Karolinska University Hospital, Stockholm, Sweden; Department of Internal Medicine, Karolinska Institutet, Stockholm, Sweden, ^dUniversity Library, Karolinska Institutet, Stockholm, Sweden, ^eClinic of Social and Family Medicine, School of Medicine, University of Crete, Crete, Greece, ^fResearch Unit for General Practice, Institute of Public Health, University of Southern, Odense, Denmark, ^gDepartment of General Practice, Charles University, First Faculty of Medicine, Prague, Czech Republic, ^hNIVEL (Netherlands Institute for Health Services Research), Utrecht, The Netherlands, ⁱDepartment of General Practice & Elderly Care Medicine, Amsterdam Public Health Research Institute, VU University Medical Center, Amsterdam, The Netherlands, ^jDepartment of Medical Sciences, Cardiovascular Epidemiology, Uppsala University, Uppsala, Sweden

*Correspondence to Axel C Carlsson, Division of Family Medicine and Primary Care, Karolinska Institutet, Alfred Nobels Allé 23, 141 83 Huddinge, Sweden; E-mail: axelcefam@hotmail.com

Abstract

The aim of this study is to identify potential facilitators and barriers for health care professionals to undertake selective prevention of cardiometabolic diseases (CMD) in primary health care. We developed a search string for Medline, Embase, Cinahl and PubMed. We also screened reference lists of relevant articles to retain barriers and facilitators for prevention of CMD. We found 19 qualitative studies, 7 quantitative studies and 2 mixed qualitative and quantitative studies. In terms of five overarching categories, the most frequently reported barriers and facilitators were as follows: *Structural* (barriers: time restraints, ineffective counselling and interventions, insufficient reimbursement and problems with guidelines; facilitators: feasible and effective counselling and interventions, sufficient assistance and support, adequate referral, and identification of obstacles), *Organizational* (barriers: general organizational problems, role of practice, insufficient IT support, communication problems within health teams and lack of support services, role of staff, lack of suitable appointment times; facilitators: structured practice, IT support, flexibility of counselling, sufficient logistic/practical support and cooperation with allied health staff/community resources, responsibility to offer and importance of prevention), *Professional* (barriers: insufficient counselling skills, lack of knowledge and of experience; facilitators: sufficient training, effective in motivating patients), *Patient-related factors* (barriers: low adherence, causes problems for patients; facilitators: strong GP–patient relationship, appreciation from patients), and *Attitudinal* (barriers: negative attitudes to prevention; facilitators: positive attitudes of importance of prevention). We identified several frequently reported barriers and facilitators for prevention of CMD, which may be used in designing future implementation and intervention studies.

Key words: Coronary heart disease, diabetes, general practitioner, health check, myocardial infarction, selective prevention, stroke.

Introduction

In spite of the decrease in coronary heart disease seen in many Western countries in recent years, cardiometabolic diseases [CMDs: cardiovascular diseases (CVDs), diabetes mellitus and chronic kidney disease] continue to be a major global health problem (1,2). As well as genetic and sociodemographic factors, CMDs are caused by unhealthy lifestyles, including poor diet, physical inactivity and smoking (3). It is estimated that >90% of instances of type 2 diabetes are preventable (4) by maintaining a healthy diet and body weight, engaging in moderate to vigorous physical activity and abstaining from tobacco smoking. While the evidence on predictors of CMD is relatively clear, applying this knowledge in a preventive primary care capacity represents a challenge for most health care professionals. In light of high prevalence of smokers, and increasing occurrence of obesity and physical inactivity, an increase in the number of patients with CMD is expected in the coming decades. Risk factors for CVD emerge early in life (5), with several studies suggesting that risk factors identified in young adults predict CVD and diabetes later in life (6,7).

Giving advice on both physical activity (8) and diet (9) has been found to be effective in reducing CVD risk factors, though the benefits of such interventions are rather small (9,10). Past research indicates that successful interventions against CVD risk behaviour should target all important risk factors, including a poor diet, sedentary lifestyle and smoking (11). Therefore, there is an urgent need to establish strategies for health care professionals to detect seemingly healthy individuals who are at high risk of developing CMD and to develop and implement interventions to prevent or delay the onset of these diseases. This approach has been termed *selective prevention*—the identification of patients who, in spite of an apparent lack of symptoms and risk factors, are nonetheless at high risk of developing CMD (12).

Particular subgroups of the population are at higher risk of CMD, including those of low socioeconomic status (13,14), immigrants migrating from developing countries (15), people with psychiatric disorders (16) and individuals with intellectual disability (17). While the issue of social inequality in health is well known (18), it is difficult to reach these subgroups of the general population with interventions aimed at reducing CMD risk. This may be due to the fact that maintaining a healthy lifestyle becomes less of a priority in the face of other, more immediate stressors and adversity (19). As such, there is an urgent need to establish inclusive strategies to identify individuals at high risk of disease and to develop and implement interventions to prevent or delay the onset of these diseases in the general population as well as in particularly vulnerable subgroups.

Obstacles against successful interventions towards a healthy lifestyle may not only be present in the general population, but also among health care professionals in primary care—the natural arena for health promotion in the general population (20). Thus, to implement successful selective CMD prevention programmes in primary care, it is important to identify potential barriers that may exist among primary care health care professionals.

Health care professionals in primary care encounter patients with divergent and poor lifestyle habits that may be harmful to cardiometabolic health (21), which make it difficult to implement selective preventive efforts. The primary care setting is a complex

system where patients and professionals' objectives may not always be in harmony, and barriers in distinct disciplines can vary widely. Therefore, we stress the importance of addressing the barriers and facilitators of effective and efficient selective prevention programmes into clinical practice in primary care (20).

The aim of this study was to conduct a systematic review of the relevant literature to identify barriers and facilitators of effective selective CMD prevention programmes in a primary health care setting.

Methods

The results of the present review will be used to develop a feasibility study of selective CMD prevention within the *Determinants of Successful Implementation of Selective Prevention of Cardiometabolic Diseases Across Europe* (SPIMEU, www.spimeu.org) project. SPIMEU aims to contribute to the reduction of cardiometabolic morbidity and mortality in EU Member States by establishing the feasibility of implementing innovative, evidence-based selective prevention actions in five EU Member States representing various health care systems. The present study is a systematic search and review (22). In the first step, we performed a backward and forward citation search of five key articles with relevant content that were known to us (23–27). The backward citation search identified articles through the reference lists in each article, and the forward citation search identified articles citing the key article using Google Scholar. Through this process we identified 30 papers. On the basis of this literature, we then identified any common search terms and keywords. In the second step, we searched without restrictions in terms of language, year or publication type in the following databases: Medline (Ovid), Embase (embase.com), Cinahl (Ebsco) and PubMed (complementary search of newly published non-indexed articles) to identify relevant articles and references. The searches were conducted by two librarians at the Karolinska Institutet University Library in March 2016. The complete search strategies are available as [Supplementary data](#). The extensive search strategy included both free text and MeSH terms and was initially created in Medline and later adapted to the other databases with corresponding vocabularies. Reference lists of included articles were also searched for relevant papers, and articles citing the already included studies were identified in further Google Scholar searches. All titles and abstracts were screened according to the inclusion criteria by either AKW, MJH or ACC. If there was any uncertainty as to whether particular articles should be included or not, the papers in question were discussed by AKW, MJH and ACC before a final decision was reached.

Inclusion criteria

Articles were retained for the review if the study focused on the following:

- Screening/prevention programmes for adult people without established CMD [all studies in patients diagnosed with CVD (or taking medication for hypertension or dyslipidaemia), diabetes mellitus or chronic kidney disease were excluded].
- Prevention of CMD (CVD, type 2 diabetes, chronic kidney disease) in a primary care setting.

- Reporting data on the barriers or facilitators for health care professionals implementing prevention.
- Articles describing health care professionals.
- Articles reporting original research (no review articles or opinion papers such as editorials).

Exclusion criteria

Articles were excluded if they focused on the following:

- Reported purely on (clinical) outcomes of preventive interventions (e.g. lower cholesterol, morbidity).
- Focused solely on study protocols, guidelines and their implementation.

If the inclusion of any articles was unclear, they were discussed among AKW, MJH and ACC, using the criteria above, before a final decision was made. The texts of the retained articles were read in full by at least two authors (PW, AKW or ACC). All full texts were screened independently by at least two authors, either AKW, ACC or PW. Any uncertainty was discussed by all three authors. PW conducted the data extraction, and all the extracted data were verified by ACC. Where consensus was found, all extracted data from the studies were tabled. Formal quality assessment was performed using Mixed Methods Appraisal Tool (MMAT) (28). The bias discovered by the use of the MMAT tool or by the authors' assessment of the included studies was recorded (e.g. response rates in quantitative studies below 60%). If no bias was discovered in the quality assessment or by the authors' assessment, 'no bias' was reported. The relevant content in the qualitative and quantitative studies was extracted in a similar fashion from the result sections and tables in the included studies.

To systematize the information, we categorized the articles by the type of barrier/facilitator they focused on, as others have previously described (29–31). In short, we organized the barriers and facilitating factors from the retained articles into *structural* (related to local, regional and national health care systems), *organizational* (related to local, regional and national health care systems), *professional*, *patient-related* context and *attitudes of health care professionals*. All barriers and facilitators reported in three or more studies were regarded as frequently reported.

Results

Figure 1 shows all screened titles/abstracts (6683 articles), with the individual included studies and relevant information on barriers and facilitators for health care professionals included in the present review. In total, 28 articles were included in the present review (23,25,29–54).

We extracted qualitative data from 19 articles, quantitative data from 7 articles and both qualitative and quantitative data from 2 of the included articles, see Figure 1 and Table 1 (55). The included studies were published between 1990 and 2016 and came from UK (9) (25,33,42,45–49,52), Canada (4) (29,32,44,51), The Netherlands (4) (23,30,37,50), Australia (3) (34–36), Denmark (2) (39,43), Germany (2) (53,54) and a few countries (Argentina (40), France (31), New Zealand (38), Singapore (41)) with one included study.

The reported barriers and facilitators from all studies included on the topic of selective prevention of CVD and chronic kidney disease are shown in Table 2.

A complete overview of barriers and facilitators from both qualitative and quantitative studies is shown in Table 3 and organized in

five fundamental categories: *structural*, *organizational context*, *professional context*, *patient-oriented factors* and *attitudes*.

The most frequently reported structural barriers were related to lack of time and extra workload (18 studies) (25,29,32–38,41,42,44,46–48,50,53,54), lack of feasible or effective counselling or advice (12 studies) (24,32,35,37,39,42,43,47,51–54), insufficient reimbursement (10 studies) (29,30,33,34,38,41,46,47,53,54), or problems with guidelines (6 studies) (30,37,40,41,43,53,54). Other structural barriers reported were related to lack of available and accessible referral instances (5 studies) (25,32,33,35,41), lack of information material for patients (4 studies) (25,32,38,53), lack of space in the building (3 studies) (25,29,37), lack of support and assistance (2 studies) (29,41) and problems related to follow-up of patients (2 studies) (23,35). Structural barriers regarding guidelines involved a lack of access to or awareness of existing guidelines (37,40,41), lack of evidence and/or guidelines on prevention (30,54), or too many guidelines for a specific purpose (41,54). The most reported structural facilitators were feasible and effective counselling and interventions (10 studies) (29,33,34,42,43,46,50–53), available assistance and support (4 studies), availability of time (3 studies) (22,41,52), adequate referral (3 studies) (29,41,50,51), identifying obstacles for prevention (3 studies) (29,39,40), adequate follow-up (2 studies) (29,50), sufficient finances (2 studies) (30,41,52), adequate patient material (2 studies) (29,35) and adequate guidelines (2 studies) (30,41,43). Other identified facilitators were use of media for health messages (24) and use of legislation for unhealthy habits, e.g. smoking (38).

The most frequently reported organizational barriers were role of practices, no responsibility to offer prevention (6 studies) (30,32,41,46,47,53), lack of access to information on patients (5 studies) (37,39,41,42,50), lack of IT support (5 studies) (24,37,41,42,46), role of primary care staff (4 studies) (33,37,43,47), lack of assistance and support services including communication problems (4 studies) (37,39,41,44), organizational problems in general (3 studies) (37,39,50) and lack of suitable appointment times for employed patients (3 studies) (25,35,44). Other organizational barriers were lack of strong leadership (38), low quality of recording (37,40) and insufficient connection with other preventive service providers (54).

The most frequently reported organizational facilitators were adequate responsibility to offer and importance of prevention (10 studies) (23,25,30,39,47,48,50,52–54), assistance and support within practice and teams (8 studies) (23,25,35,37,38,41,48,50), IT support (5 studies) (35,37,38,41,46,49), flexibility in counselling (5 studies) (29,33,43,52,53), opportunity of health checks and prevention (5 studies) (34,36,42,47,48), important role of practice nurses (4 studies) (23,32,37,49), structured organization of practice (4 studies) (30,37,50,51) and cooperation with allied health staff or community resources (3 studies) (29,38,54). Other organizational facilitators were functioning appointment system (35,48), interventions tailored to target identified barriers (40), need of an integrated electronic patient record system (37) and access to patient information or register (41,50).

The most frequently reported professional barriers were lack of counselling skills and education (6 studies) (29,32,45,49,53,54), lack of knowledge of preventive care (5 studies) (32,33,35,37,40,42) and lack of experience (3 studies) (23,33,41). Lack of counselling skills pertained to insufficient education/training/experience to competently communicate information on risk and lifestyle habits. Yet the most frequently reported facilitating professional factors were sufficient training and education (10 studies) (35,38,42,45,48,49,51–54)

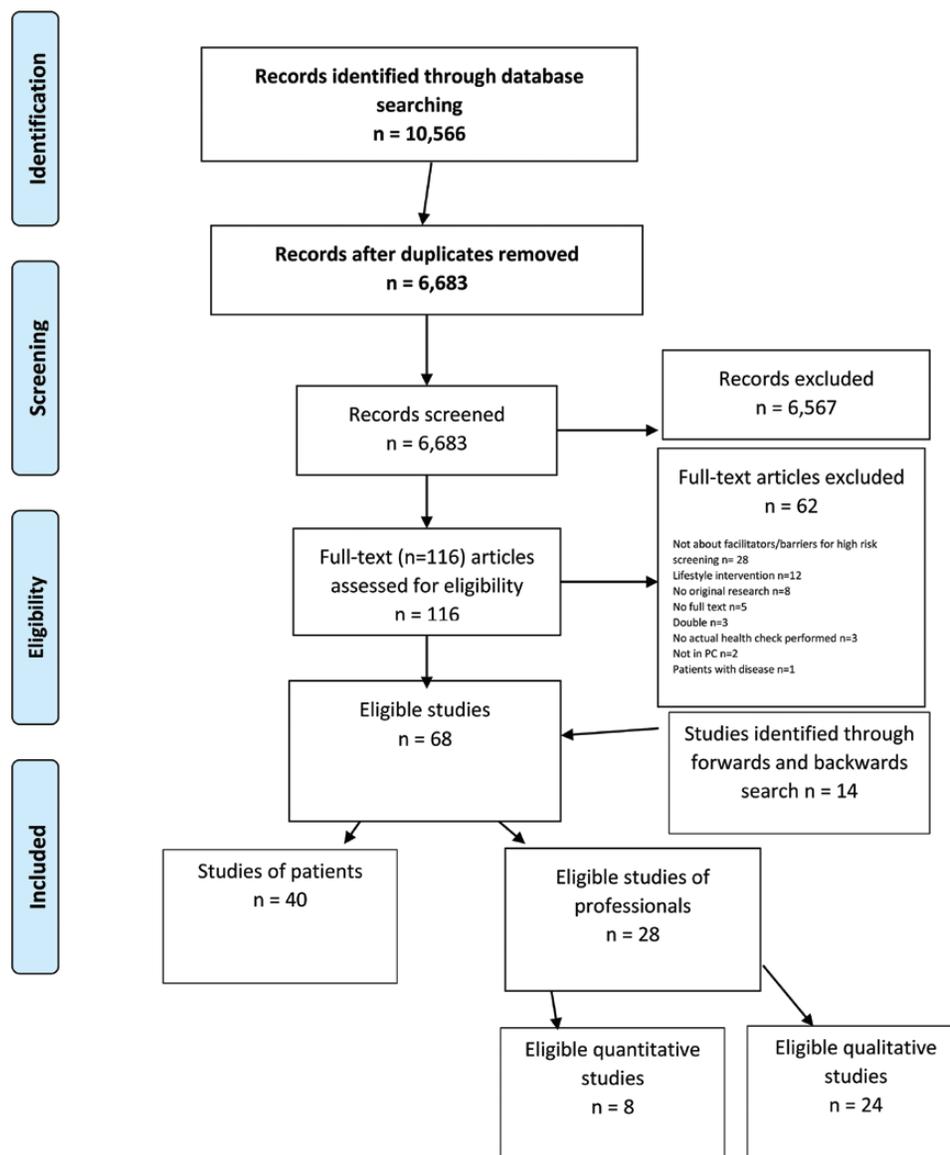


Figure 1. PRISMA 2009 flow diagram. From Moher et al. (63). For more information, visit www.prisma-statement.org.

and that motivation of patients is effective (4 studies) (25,50,52,53). Other facilitating factors were related to sufficient knowledge (53) and female gender of GP (49,53).

The most frequently reported patient-related barriers concerned lack of adherence (9 studies) (32,33,37,38,41–43,47,53) and causing problems to patients (5 studies) (33,39,47,49,50), e.g. medicalization or anxiety. Other noted barriers involved were low awareness among patients (36), lack of support from patients' families (44), lack of trust in GP–patient contact (41) and cultural differences (54). On the other hand, the most frequently reported patient-related facilitating factors concerned a strong GP–patient relationship (5 studies) (33,36,38,41,51) and that patients do appreciate the preventive measures (4 studies) (33,39,46,50). Other factors were related to the motivation of patients (25,36) and potential of enlisting the help of family and friends (29,44).

The most frequently reported attitudinal barriers were negative attitudes to prevention (16 studies) (25,29,33–35,37,38,40,42,43,46,47,49,51,52,54). Other attitudinal barriers were lack of acceptability (50) and of feasibility (50). The most

reported attitudinal facilitators were positive attitudes towards the importance of prevention (14 studies) (25,34,35,38,42,46–54). Other facilitators were acceptability (50) and feasibility (34).

Discussion

We have identified several structural, organizational, professional, social context and attitudinal barriers and facilitators for selective prevention of CMD in primary care. The most frequently reported and important barriers listed were lack of time and reimbursement and lack of counselling skills. The most frequently reported facilitators were positive attitudes towards prevention and awareness of the effectiveness of health checks.

In terms of the generalizability of our results, there appears to be reasonable consistency across the reviewed studies, irrespective of continent, world region, or country of origin. Results are also relatively stable across time, with new studies reporting similar barriers and facilitators as older ones. However, the majority of studies were carried out in The Netherlands, or the UK and other

Table 1. Information of included studies of barriers and facilitators in health care professionals to do selective primary prevention of cardiovascular, diabetes and chronic kidney disease in patients without established cardiometabolic disease in primary care. (The search was conducted in March 2016.)

Author, publication year, country	Type of study	Health care groups	Responders, <i>n</i>	Response rate	Patient ages	Population	Comments
Mann, 1990, Canada	Qualitative	GPs	50				Interviews
Calnan, 1993, UK	Quantitative	GPs	1092	64%			Postal survey
Hulscher, 1997, The Netherlands	Quantitative	GPs	195				Survey
Makrides, 1997, Canada	Qualitative	GPs	16 + 15				Focus groups and interviews
Grant, 1998, Canada	Quantitative	GPs, PNs	156	78%			Phone survey
Steproe, 1999, UK	Quantitative	GPs, PNs	107 + 58	100%			Postal survey
Williams, 2004, UK (Wales)	Qualitative	PHC staff: GPs, PNs;	21 + 22				Focus groups
Wright, 2006, UK	Qualitative	CMHT staff: psychiatrists, psychiatric nurses, social workers, occupational therapists	8 + 2; 7 + 10 + 7 + 1		18–65 years	Severe mental illness	Interviews
Pelletier-Fleury, 2007, France	Quantitative	GPs	86				Observational
Amoroso, 2009, Australia	Qualitative	GPs, PN	13 + 1		45–49 years		Interviews
Ampt, 2009, Australia	Qualitative	GPs, PN	15 + 1		45–49 years		Interviews
Graffy, 2010, UK	Quantitative	GPs, PNs, HCAs, PMs	4 + 7 + 3 + 4		40–69 years		Focus groups
Wan, 2010, Australia	Qualitative	GPs	22	85%			Interviews
Voogdt-Pruis, 2011, The Netherlands	Qualitative	GPs, PNs	25 + 6				Focus groups
Doolan-Noble, 2012, New Zealand	Qualitative	GPs, PNs, PHO information analyst	14 + 14 + 1				Focus groups
Huy, 2012, Germany	Quantitative	GPs	260	13%			Postal survey
Sondergaard, 2012, Denmark	Qualitative	GPs	16	16%			Focus groups
Ferrante, 2013, Argentina	Qualitative	GPs, PNs, social workers, PMs, area managers	15 + 10 + 20 + 5 + 5		≥40 years		Interviews
George, 2013, Singapore	Mixed	GPs	302	25%			Survey, free text
Godefrooij, 2014, The Netherlands	Qualitative	GPs, PNs, medical receptionists	5 + 3 + 5				Focus groups
Vos, 2014, The Netherlands	Qualitative	GPs, PNs, HCAs, PMs, administrator	7 + 1	39%			Witness seminar; interview
Baker, 2015 UK	Mixed	GPs, PNs, HCAs, PMs,	2 + 6 + 2 + 14 + 1		40–74 years		Interviews
Barfoed, 2015, Denmark	Qualitative	GPs	10				Interviews
Diehl, 2015, Germany	Quantitative	GPs	40/74	33.9%			Postal survey
Gavarkovs, 2015, Canada	Qualitative	CDPM programme delivery staff	10			Men	Telephone interviews
Ismail, 2015, UK	Qualitative	GPs, PNs, HCAs, PMs, other support staff	58				Interviews
Riley, 2015, UK	Qualitative	GPs, PNs, HCAs, pharmacists	5 + 5 + 3 + 2				Interviews
Kraska, 2016, UK	Qualitative	PMs	23				Postal survey, free-text questions

Population only indicated when a specific target population other than the general population is relevant.

CDPM, community-based chronic disease prevention and management; CMHT, community mental health teams; HCAs, health care assistants; PHCs, primary health care centres; PHO, primary health organization; PMs, practice managers; PNs, practice nurses.

Table 2. Studies of barriers and facilitators in health care professionals to perform selective primary prevention of cardiovascular, diabetes and chronic kidney disease in patients without established cardiometabolic disease in primary care. (The search was conducted in March 2016.)

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Mann, 1990, Canada	Qualitative	Knowledge, attitudes and perceptions (lack of counselling skills, lack of belief in the efficacy of the activities) Conditions in which the activities occur (lack of available and accessible referral, lack of time) Reactions of others to the activities (lack of patient compliance) Difficulties in counselling (lack of appropriate, effective patient education materials)	Engaging a nurse to alleviate lack of time for GPs GPs most effective in dealing with high blood pressure Physician counselling effective in helping patients quit smoking	Focused on barriers to prevention
Calnan, 1993, UK	Quantitative	Negative attitudes to prevention ^a (health education is dull and boring, causes problems for the patients) Inappropriate skills ^a	Positive attitudes to prevention ^a Training in health promotion ^a Higher number of practice nurses ^a GP spends more hours on research and training ^a Positive attitudes by female GPs ^a Assistance ^a (from facilitator, or authorities) IT support ^a	No
Hulscher, 1997, The Netherlands	Quantitative	Poor organization of practice to provide preventive services (lack of registration of activity for self-assessment of progress, lack of written protocols of agreement, not familiar with population approach) Acceptability [risk of causing medicalization in patients at risk for CVD (51%)] Feasibility [not enough time and opportunity (44%), lack of necessary data to screen and detect risk groups (50%)]	Organization of practice [availability of a sex-age register ^a , regular team work meetings ^a , more practice assistance (not significant)] Acceptability [detection and treatment of hypertension will not cause anxiety (51%), patients appreciate monitoring of health (59%)] Responsibility [significant to smaller list size and proactive invitation of patients ^a ; CVD prevention is an important task in primary care (78%)] Self-efficacy [significant to registration of follow-up appointments ^a ; GPs and PNs can motivate patients to live more healthy (70% and 72%), GPs and PNs can motivate hypertensive patients to follow advice (79% and 70%), GPs and PNs could be important support to stop smoking (82% and 65%), can contribute to a healthier way of living (45%)] Identify prevention strategies:	No
Makrides, 1997, Canada	Qualitative	Structural obstacles (funding, time, patient's expectations, sparse community resources) Organizational (inadequate space, organization of practice around the traditional treatment-oriented medical model, negative staff attitude toward prevention) Personal (negative attitude toward prevention, lack of motivation, inadequate counselling skills, poor memory)	Viewing all visits as an opportunity for prevention Targeting risk factors Providing one-on-one counselling Providing group counselling Providing simple educational materials Offering clear and consistent advice Ensuring adequate follow-up Referring to other health professionals and community resources Enlisting the help of family and friends Identifying/addressing patient's personal obstacles Identifying/addressing socio-environmental obstacles	No

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Grant, 1998, Canada	Quantitative	Interventions to improve lifestyle ineffective (stress reduction 72.2%, weight loss 69.2%, smoking 59.1%, increasing physical activity 58.1%, diet 48.1%) Uncertain efficacy of available interventions (51.9%)	Relationship with patients (96.7%) Personal knowledge (77.6%) Compliance of patients (75.0%) Personal commitment (66.7%) Efficacy of available interventions (50.0%) Availability of time (41.0%) Opportunity to refer (28.2%) Organization of practice (25.6%) Good skill in managing risk factors (from 84.5% for council for lifestyle factors to 99.3% in screening) Responsibility to act as a health educator (GP 70.2%, PN 87.5%) Have time for prevention (GP 29.8%, PN 62.5%) Feel properly trained (GP 48.6%, PN 48.2%) Health professionals very influential in persuading people to change lifestyle (GP 24.0%, PN 33.9%)	Focus on knowledge of different risk factors
Steproe, 1999, UK	Quantitative	Difficult to counsel patients about an alternative lifestyle (GP 24.8%, PN 25.5%; GP 53.5%, PN 60.0% neutral) Doubt that health professionals very influential in persuading people to change lifestyle (GP 62.5%, PN 62.5% neutral) Doubt that lifestyle counselling is very effective (GP 70.5% neutral)	Can offer patients a great deal in the way of lifestyle counselling (GP 17.3%, PN 50.0%) Lifestyle counselling is very effective (GP 20.0%, PN 53.6%) Possible to persuade patients to modify lifestyle: Hypertension (GP 50.0%, PN 62.5%), high cholesterol (GP 44.2%, 58.9%), smoking (GP 34.6%, 23.2%), obesity (GP 25.0%, PN 32.1%), physical activity (GP 24.0%, PN 34.5%) Overall attitude of effectiveness of lifestyle modification (6.57 of scale 0–10, higher score more effective) Importance of prevention High-risk patients should be seen anyway	
Williams, 2004, UK (Wales)	Qualitative	Existing workload, lack of resources Questionable role of primary care as a 'screening service', and not responsibility of primary care Prevention: the responsibility of individuals, and agencies other than primary care, especially outside the health sector Conflict and concern about increasing specialization (here diabetes) Perceived low motivation of patients to modify their lifestyle Unnecessary medicalization No evidence that interventions delivered through primary care are effective		Concerns type 2 diabetes only

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Wright, 2006, UK	Qualitative	Lack of appropriate resources in existing services, e.g. time, trained staff Lack of funding Lack of familiarity in general practice with severe mental illness, also negative attitudes to work with these patients Lack of knowledge regarding CHD risk factor screening and difficulties in interpreting screening results and implementing appropriate interventions Mental patients harder to engage, prior experience of low attendance, perceived difficulty in making lifestyle changes A screening offer might be viewed as interference in patients' lives, and some patients get anxious Lack of appropriate services to refer patients Staff resistance to more changes in their role Urban practice ^a (OR 0.66; 95% CI 0.65–0.68) Density of GPs ^a (OR 0.76; 95% CI 0.63–0.92)	Flexible solutions with clear lines of responsibility for assessing, communicating and managing CHD risks Mental patients are at high risk, with bad lifestyle manners, needing interventions GPs possess medical expertise Less stigmatising to attend primary care for screening Patients have better links, trust and a longer history with their GP	Concerns patients with severe mental illness Views from both primary care and community mental health teams
Pelletier-Fleury, 2007, France	Quantitative		Daily work load ^b (OR 1.03, 95% CI 1.01–1.05) Elderly patient list (>65 y) ^b (OR 1.04; 95% CI 1.02–1.07) High health care consumption ^a (OR 4.29; 95% CI 3.62–5.00) A useful opportunity to assess and manage risk factors A belief that preventive care was part of their role and responsibility Health check feasible	Register study of preventive services Short follow-up time
Amoroso, 2009, Australia	Qualitative	Time Low remuneration Attitude that prevention do not have a high priority Attitude of scepticism about the value of a health check Management, in particular motivating patients to change their behaviour, proved to be more difficult		
Ampt, 2009, Australia	Qualitative	Time Doubt on the effectiveness of general dietary recommendations Motivational interviewing good in theory, but difficult in practice Difficult to motivate patients to change behaviour Difficult in motivating patients to stop smoking Negative attitudes towards assessment of nutrition, alcohol and physical activity Cost of follow-up visit Difficult to access referrals in working hours Lack of knowledge regarding the role of the exercise physiologist Advice offered by a dietician would be no different to that offered by the GP, and thus referrals were of little value	Usefulness of a computer-based template or patient education and assessment resources Training in motivational interviewing Experience and interest in addressing drug and alcohol issues Giving advice and educating the patient were viewed as a professional responsibility Printed material reinforced any message Practice having an appointment system, as follow-ups could more easily be arranged Quitline (a free smoking referral telephone service) has no restriction to working hours Support services could actually help to motivate patients Potential greater success may be achieved by addressing whichever factor the patient was more ready to change first Primary care teams can play a major role in affecting patients' ideas	Selection bias towards higher participation among health care professional with an interest for prevention

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Graffy, 2010, UK	Quantitative	Workload	Importance of administrative support Efficient systems to identify, invite and follow up patients Flexible appointments for people in work Tagging notes to invite non-attenders when they consult Team meetings contribute to a sense of ownership Training, both at the outset and for new staff Seeing patients benefiting of screening affirms the sense of the value of screening	Selection bias with participation of practices with screening experiences Concerns screening of type 2 diabetes, positive experiences
Wan, 2010, Australia	Qualitative	Low awareness among patients Time pressure Risk of 'touting for business' when booking another visit for risk discussion with a new patient	A strong GP-patient relationship, common ground on priorities between GPs and their patients, Patient's self-motivation a key issue Opportunistic screening easier with regular patients	Selection bias with including GPs with interest in prevention Study included both patients and health care staff
Voogdt-Pruis, 2011, The Netherlands	Qualitative	Workload Lack of physical space Lack of motivation for patients Lack of GP knowledge about the guidelines Different attitudes towards treatment targets Lack of communication, between nurses and GPs and between GPs and second care Insufficient coaching by doctors Content of lifestyle advice Concern of losing nursing tasks for nurses Lack of ability of stop-smoking treatment Organizational issues (insufficient patient recording and computer systems) Considerable effort to get patients to attend, difficult to motivate patients who rarely visited the practice Poor record keeping (smoking behaviour, diagnoses and treatment by specialist)	Nurses could play an important role in preventive care Extending clinic opening hours Desirable to implement a chain of care and an integrated electronic patient record system	Experiences of implementing nurse-delivered prevention
Doolan-Noble, 2012, New Zealand	Qualitative	Time and workload Insufficient funding Lack of strong leadership and consistent messages Difficulty in handling asymptomatic high CV risk patients, and to communicate and motivating behaviour change (e.g. low SES patients, fatalistic views of patients) Attitude of low benefits of behaviour change Design of flip charts unsatisfactory	Ensure infrastructure, including training and to consider how the programme would be implemented Co-location of allied health staff in an integrated centre The need for ongoing tobacco legislation and positive food legislation Clarity around the roles and responsibilities of GPs and practice nurses Primary health care's longitudinal relationship with patients Attitude of high benefits of behaviour change Useful electronic tools Incentives for patients for motivation and support lifestyle changes	No

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Huy, 2012, Germany	Quantitative ^b	Lack of time (91%) Insufficient remuneration (92%) Many different guidelines (73%) Unclear recommendations (60%) Lack of training (70%) Lack of material for patients (77%) Lack of adherence among patients (98%)	I can offer my patients a wide range of lifestyle advice (49.1%) ^a (OR 3.55; 95% CI 1.82–6.93) Risk factor questionnaires in the waiting room (61.5%) ^a (OR 2.26; 95% CI 1.06–4.85) Female gender of GP ^a (OR 1.98; 95% CI 1.04–3.76) Knowledge about positive lifestyle effect (54%) Prevention is a GP responsibility (40.9%) Not difficult to give advice on lifestyle changes (47.0%) Well educated for advice on healthy lifestyle (44.2%) Can successfully motivate patients to live healthier (45.6%) Preventive health checks beneficial for the patients	Response rate 13%
Sondergaard, 2012, Denmark	Qualitative	Reservations if the health checks were a core mission of primary care Uncertainty about the best approach Reservations about inducing negative psychological reactions and decreased well-being among patients Lack of awareness of guidelines Lack of knowledge about preventing cardiovascular disease Communication problems within health teams Lack of motivation Organizational problems	Intervention tailored to target identified barriers	Focused on barriers for designing an intervention
Ferrante, 2013, Argentina	Qualitative	Low quality of recording Lack of direct access/co-management with renal physician Lack of interest	Access to/co-operation with renal specialist Adequate remuneration Technological assistance, IT Patient education, also to trust the GPs	Concerns screening for chronic kidney disease Response rate of quantitative survey 25%
George, 2013, Singapore	Mixed	Nature of my practice Lack of confidence and faith Lack of sufficient support and experience Lack of time to keep up-to-date. Lack of medicine for CKD Lack of IT support. Too much paperwork Lack of patient education Poor patient compliance Lack of family/ social support management Lack of time to explain to the patient Quantitative results: Lack of access to patient's information (from hospital) (4.7) Lack of access to evidence-based guidelines (4.3) Inability to bill (4.5) Lack of patient's trust in GP (3.9) Inability for patient to pay (3.7) Lack of time for consultation (3.6) Lack of support services (staff, technical) (2.3)	Quantitative results: Less cost for patient (2.5) Access to patient's information (2.8) Access to updates and guidelines (3.0) More support services (3.2) Less time consumed (3.3)	

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Godefrooij, 2014, The Netherlands	Qualitative	Lack of experience in the design and implementation of a structured, large-scale prevention programme, suboptimal instruction of involved staff No clear policy about how to follow up patients with 'medium risk', not exceeding the risk to be referred to their GP	Importance of primary prevention (high yield of health check, helped GPs to identify their high-risk population in a structured manner) Collaboration, i.e. 'delegation of care', health checks were delivered by medical receptionists and practice nurses, and GPs involved for high-risk patients	Study included both patients and health care staff
Vos, 2014, The Netherlands	Qualitative	Organizational context: insufficient reimbursement Professional context: lack of evidence and guidelines Social context: no focus on prevention	Organizational context: sufficient logistic and practical support and finances Responsibility to offer prevention, equity Professional context: evidence and guidelines Social context: prevention focused on Opportunistic approaches	No
Baker, 2015 UK	Mixed	Extra workload Insufficient knowledge Lack of information collected by the practice prior to the appointment Programme tools developed to aid the assessment process and reduce staff time were not necessarily being used to their full effect Difficulty in engaging patients who were potentially able to receive the most benefit Less confident in second appointments (CVD risk assessment, mean = 3.52, SD = 1.3), risk communication (mean = 2.68, SD = 0.1.8) and changing behaviours (mean = 2.44, SD = 1.6) Mixed opinions concerning the quality of lifestyle services referred to: Weight management (mean = 3.76, SD = 0.90) and alcohol services (mean = 3.76, SD = 0.90) were the lowest rated Some participants were not aware of what health trainers were	Practices periodically reviewed the non-responder list and reissued invites Practices were most confident in first appointments (pre-assessment blood tests, mean = 4.12, SD = 0.60), invitations (mean = 4.04, SD = 0.79) and laboratory tests (mean = 4.04, SD = 0.79) Mixed opinions concerning the quality of lifestyle services referred to: smoking cessation was rated most highly (mean = 4.43, SD = 0.59), health trainers were rated highly (mean = 4.13, SD = 0.83) HCs were useful in early detection and giving the time to discuss patient health and lifestyles (72%) Delivery of HCs in a wider range of settings, e.g. work places More than two-thirds (70.8%) of practice staff indicated that they had training in CVD prevention and 44% (n = 11) indicated that they required further training A need to promote the programme more effectively Conclusions: Adopting continuous approaches to knowledge development and transfer; improve confidence in HCs to deliver meaningful results	Small sample size, no re-sponse rate given
Barfoed, 2015, Denmark	Qualitative	Caution concerning the programme's overall effectiveness Guidelines inhibit the ability to practice independently as a GP Risk communication tools are insufficient Resigned approach to manage patient compliance Insufficient reimbursement (90.2%) Difficult to give advice on unhealthy habits (73.5%) Cultural differences (59.1%) Insufficient connection with other preventive service providers (56.7%) Lack of time (54.5%) Attitude that patients cannot change lifestyle (49.1%) Difficult to follow guidelines (too many (43.1%), insufficient evidence (28.5%), unclear recommendations (24.9%) Lack of education/training (24.8%)	Guidelines good and applicable Use of different communication tools depending on the patient context Confrontational approach to manage low patient compliance	No
Diehl, 2015, Germany	Quantitative		Responsibility to take a role as a health advisor (96.2%) Feeling well prepared for and successful of prevention (80.9%) Successful in motivating patients to a healthy lifestyle (72.6%) Networking with cooperation partners (70.7%) Being one of the most important influence factors on patients lifestyle (69.3%)	Response rate 34%

Table 2. Continued

Author, publication year, country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
Gavarkovs, 2015, Canada	Qualitative	Time and travel constraints Unawareness of spouses of disease prevention programmes Lack of suitable male programme leaders Interfering with high work season of patients Lack of staff time/hours, increased workload Lack of space in the building Insufficient software Lack of leaflets and posters Lack of awareness of health checks Lack of resources to motivate and support patients in life-style changes	Hiring qualified male instructors Engaging spouses Evolution of the programme over time in response to local needs to suit the particular characteristics of the patient population Individual staff characteristics such as being proactive, enthusiastic and having specific responsibility A supportive team Clear information to patients what the screening entails, including possible benefits and potential harm Messages in media to raise awareness of health checks Importance of the existing relationships between GPs and patients Attitude that health checks are beneficial and to identify high-risk patients Attendants are motivated and open to advice	Concerns recruiting male participants in a rural district No
Riley, 2015, UK	Qualitative	Problems in reaching important groups with unhealthy behaviours and low motivation for changes Lack of adherence to advices Interference with working time of possible attendants Doubt on impact of the programme Lack of referral services		
Krska, 2016, UK	Qualitative	Concerns about the skill set of some staff to competently communicate risk and lifestyle information Time constraints/pressure of work Increased nurse workload impacted on other services Insufficient payments Problems with software Attitude that health checks are a waste of time	Sufficient training to equip health care staff with appropriate skills and knowledge to deliver the service effectively IT support Effective software Health checks beneficial for patients	Study included both patients and staff Focus on implementation of health checks

Baker: 1–5 scale. Percentages denote rate of participants giving this statement.

CDPM, community-based chronic disease prevention and management; CHD, coronary heart disease; CKD, chronic kidney disease; CMHT, community mental health teams; CVD, cardiovascular diseases; HC, health care; PHCs, primary health care centres; PMs, practice managers; PNs, practice nurses; SES, socioeconomic status.

^aSignificant factors when statistical analyses were performed [with odds ratio (OR) and 95% confidence interval (95% CI) when shown in the article].

^bObstacles include great, medium or small barriers.

^cObstacles mean rank of severity (1–7, 1 denotes easiest obstacle, 7 most difficult); motivational factors mean rank of motivation (1–5, 1 the most motivating factor, 5 the least motivating factor).

Table 3. Overview of barriers and facilitators in health care professionals to do selective primary prevention of cardiometabolic diseases in patients without established disease in primary care (The search was conducted in March 2016.)

Context	Barriers	Facilitators
Structural context	Lack of time, extra workload (18 studies) Lack of space in the building (3 studies) Insufficient reimbursement or community resources (10 studies) Guidelines: lack of awareness of guidelines, lack of evidence and guidelines, too many guidelines in the area, or difficult to follow guidelines (6 studies) Lack of available and accessible referral (5 studies) Lack of assistance and support from authorities (2 studies) Lack of material for patients (4 studies) Lack of effective and feasible counselling (12 studies) Problems related to follow-up (2 studies)	Availability of time (3 studies) ^a Sufficient finances (2 studies) Access to good guidelines (2 studies) Ensuring adequate referral (3 studies) ^a Ensuring adequate follow-up (2 studies) ^a Assistance and support from authorities (4 studies) ^a Identifying obstacles for prevention (3 studies) Providing information and educational materials (3 study) Counselling and interventions feasible and effective (10 studies) ^a Information in media (1 study) Legislation for unhealthy habits (e.g. smoking) (1 study) Structured organization of practice (4 studies) ^a
Organizational context	Organizational problems in general (3 studies) Lack of strong leadership and consistent messages (1 study) Lack of IT support, software (5 studies) Lack of local support services, communication problems (4 studies) Insufficient connection with other preventive service providers (1 study) Lack of access to information on patients (5 studies) Low quality of recording (2 studies) Lack of suitable appointment times for employed patients (3 studies) Role of practices, no responsibility to offer prevention (6 studies) Roles of primary care staff (4 studies)	IT support (5 studies) ^a Assistance and support within practice and teams (8 studies) ^a Important role of practice nurses (4 studies) ^a Cooperation with allied health staff or community resources (3 studies) Access to patient information or register (2 studies) ^a Integrated electronic patient record system (1 study) Appointment system (2 studies) Intervention tailored to target identified barriers (2 study) Flexibility in counselling (5 study) ^a Responsibility to offer and importance of prevention (10 studies) Useful opportunity of health checks and prevention (5 studies)
Professional context	Lack of education/training/skills to competently communicate risk and lifestyle information (lack of counselling skills) (6 studies) ^a Lack of knowledge (5 studies) Lack of experience (3 studies)	Sufficient training and education (10 studies) ^a Effective in motivating patients (4 studies) Sufficient knowledge (1 study) Female GPs (2 studies) ^a
Patient-oriented factors	Low awareness of patients (1 study) Low adherence of patients (9 studies) Lack of trust in GP–patient relation (1 study) Lack of social support from families or friends (1 study) Causes problems, i.e. anxiety and medicalization (5 studies) Cultural differences (1 study)	Motivation of patients (2 studies) A strong/longitudinal GP–patient relationship (5 studies) Enlisting the support from family and friends (2 studies) Appreciated by patients (4 studies)
Attitudes	Negative attitudes in general to prevention (16 studies) Doubt on acceptability (1 study) Doubt on feasibility (1 study)	Positive attitudes to prevention in general (14 studies) ^a Acceptability (1 study) Feasibility (1 study)

The numbers of studies reporting a specific factor are given.

^aSignificant factors when statistical analyses were performed.

English-speaking countries such as Australia, Canada and New Zealand, all of which have similar primary care and health care systems. This begs the question of how representative our sample of studies actually is. Indeed, two noteworthy studies from countries outside of the mainstream reported diverging results. Specifically, a French study indicated high variability between doctors in their willingness to take a preventative approach to CMD (31). Another study from Singapore described how GPs screened their patients for chronic kidney disease with the aim to improve collaborative care (41). It is important to note that the health care system from the countries where all other studies originate in may have influenced the results and could explain the similarities of findings in these studies, allowing the specific organization of primary care or health care in general to be reflected.

In regard to earlier reviews in the area (10,20,56), Rubio-Valera concluded that there is a lack of research into the barriers and facilitators of implementation of prevention and health promotion activities in primary health care, and further that multi-risk management is scarce (20). Regarding specific lifestyle factors, an earlier review concluded that ‘research on physical activity interventions has shown clear evidence of small but positive effects of such intervention in primary care settings, but evidence of specific strategies and sample characteristics associated with greater effectiveness is still needed to enhance the implementation of interventions under routine clinical conditions’ (10). It is important to identify barriers and motivate primary health care professionals. In fact, a review of lifestyle interventions showed that dietary and smoking interventions proved more effective in the long term than standard primary care practice (56).

One area of contention in preventive health care is related to whether interventions should target only high-risk groups or the general population as well, that is, should preventive measures be taken to prevent CMD in groups at low or moderate risk as well as those at high risk? In regard to diabetes prevention, identifying high-risk individuals in the general population could be difficult (57), thus favouring prevention in the general population over a selected high-risk group (58). The current European guidelines suggest screening all men >40 years and all women >50 years (59).

In order to mitigate the difficulties involved in selective CMD prevention programmes, detailed planning to overcome the barriers and to promote facilitators is needed before prevention programmes are initiated. However, owing to divergent results in studies conducted in countries with different health care systems, our recommendation to researchers interested in initiating selective prevention interventions is to not only design the initiative based on the best available evidence, but also tailor the programme as precisely as possible to the specific health care system for which it is intended. This will optimize the chances of success of the programmes.

One of the frequently reported barriers was the lack of evidence or the lack of belief in the evidence for prevention. This is partly true, as there is evidence that prevention works to prevent single cardio-metabolic events, but a review concluded that 'it is not possible to make clear recommendations about the economic value of screening programmes for CMD' (60). There is also limited evidence to suggest that CVD systematic risk assessment may have some favourable effects on cardiovascular risk factors (61). Furthermore, in low- and middle-income countries, no conclusions were to be drawn on the effectiveness of multiple risk factor interventions on combined CVD events and mortality (62).

A limitation of the present review relates to the fact that most of the articles included in the review were qualitative making the importance of the results challenging to quantify in any other way than the number of studies reporting each type of barrier and facilitator. Further, in terms of the quantitative articles, it was not meaningful to perform a meta-analysis owing to the different topics in the included articles. As a result, we extracted relevant information from the quantitative studies in a similar fashion as we extracted the relevant information from the qualitative studies, according to relevance and not according to any preset tool.

We also acknowledge that individual studies that we include have several types of bias and that the bias of each included study might influence the validity in reported barriers and facilitators. All bias and shortcomings were reported, and none of them were regarded as serious to the point where we considered exclusion. If a barrier or facilitator is frequently reported, the likelihood of it being true is greater, which is why we also report those reported in three or more studies.

We did not find any quantitative studies on barriers and facilitators of prevention of diabetes in primary care. This represents a knowledge gap that needs to be bridged.

Another limitation pertains to the fact that most of the relevant European studies we identified were conducted in the UK and The Netherlands. Thus, the conclusions drawn may not be representative for other parts of Europe.

The main strengths of this review involve the rigorous search strategy, performed by an experienced librarian, in Medline (Ovid), Embase, Cinahl and PubMed. The search was completed with a backward search for articles based on the reference lists of included articles and a forward search on articles citing the included articles through Google Scholar. Besides, the articles found this way were checked by another person than the one who performed the search,

and results were discussed when there was any doubt of inclusion or exclusion. We believe that this scrutiny was sufficient and that little relevant information was missed. Furthermore, we screened all included articles using a quality tool, and except for low participation rates in a few studies, all studies had adequate quality.

Conclusion

Structural, organizational, professional, social context and attitudinal barriers and facilitators of selective CMD prevention efforts in primary care were identified in both qualitative and quantitative studies. The most frequently reported barriers were lack of time, reimbursement and adequate counselling skills. The most frequently reported facilitators were positive attitudes of importance of prevention including a high yield of health check. We found that many factors were similar across various settings and countries, yet a few studies were performed in countries with different primary health care systems, complicating comparison. Ultimately, in addition to studying our review of the relevant evidence, we suggest that before initiating selective prevention studies researchers should study local factors in order to best tailor the intervention to the intended setting.

Supplementary material

Supplementary material is available at *Family Practice* online.

Declarations

Funding: This review is part of the project/joint action '663309/SPIM EU' which has received funding from the European Union's Health Programme (2014–2020).

Conflict of interest: none.

References

1. Kesteloot H. Evolution of all-cause, cardiovascular and cancer mortality rates in the age class of 85 years and above. Period 1950–2000. *Acta Cardiol* 2007; 62: 113–8.
2. Laribi S, Aouba A, Resche-Rigon M *et al*. Trends in death attributed to myocardial infarction, heart failure and pulmonary embolism in Europe and Canada over the last decade. *QJM* 2014; 107: 813–20.
3. Yusuf S, Hawken S, Ounpuu S *et al*. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004; 364: 937–52.
4. Perry IJ. Healthy diet and lifestyle clustering and glucose intolerance. *Proc Nutr Soc* 2002; 61: 543–51.
5. Persson LG, Lindström K, Lingfors H *et al*. Cardiovascular risk during early adult life. Risk markers among participants in "Live for Life" health promotion programme in Sweden. *J Epidemiol Community Health* 1998; 52: 425–32.
6. Persson LG, Lingfors H, Nilsson M *et al*. Lifestyle, biological risk markers, morbidity and mortality in a cohort of men 33–42 years old at baseline, after 24-year follow-up of a primary health care intervention. *Open J Prev Med* 2015; 5: 92–102.
7. Persson LG, Lingfors H, Nilsson M *et al*. The possibility of lifestyle and biological risk markers to predict morbidity and mortality in a cohort of young men after 26 years follow-up. *BMJ Open* 2015; 5: e006798.
8. Shaw K, Gennat H, O'Rourke P *et al*. Exercise for overweight or obesity. *Cochrane Database Syst Rev* 2006; CD003817.
9. Rees K, Dyakova M, Wilson N *et al*. Dietary advice for reducing cardiovascular risk. *Cochrane Database Syst Rev* 2013; CD002128.
10. Sanchez A, Bully P, Martinez C *et al*. Effectiveness of physical activity promotion interventions in primary care: a review of reviews. *Prev Med* 2015; 76(suppl): S56–67.

11. Strid C, Lingfors H, Fridlund B *et al.* Lifestyle changes in coronary heart disease—effects of cardiac rehabilitation programs with focus on intensity, duration and content—a systematic review. *Open J Nurs* 2012; 2: 420–30.
12. Institute of Medicine. *Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research*. Washington, DC: The National Academies Press, 1994.
13. Rosengren A, Hawken S, Ounpuu S *et al.* Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case–control study. *Lancet* 2004; 364: 953–62.
14. Carlsson AC, Starrin B, Gigante B *et al.* Financial stress in late adulthood and diverse risks of incident cardiovascular disease and all-cause mortality in women and men. *BMC Public Health* 2014; 14: 17.
15. Wändell PE, Carlsson A, Steiner KH. Prevalence of diabetes among immigrants in the Nordic countries. *Curr Diabetes Rev* 2010; 6: 126–33.
16. Wändell P, Ljunggren G, Wahlström L *et al.* Diabetes and psychiatric illness in the total population of Stockholm. *J Psychosom Res* 2014; 77: 169–73.
17. Glover G, Williams R, Heslop P *et al.* Mortality in people with intellectual disabilities in England. *J Intellect Disabil Res* 2017; 61: 62–74.
18. Clark AM, DesMeules M, Luo W *et al.* Socioeconomic status and cardiovascular disease: risks and implications for care. *Nat Rev Cardiol* 2009; 6: 712–22.
19. Marmot MG. Status syndrome: a challenge to medicine. *JAMA* 2006; 295: 1304–7.
20. Rubio-Valera M, Pons-Vigués M, Martínez-Andrés M *et al.* Barriers and facilitators for the implementation of primary prevention and health promotion activities in primary care: a synthesis through meta-ethnography. *PLoS One* 2014; 9: e89554.
21. Carlsson AC, Wändell PE, Gigante B *et al.* Seven modifiable lifestyle factors predict reduced risk for ischemic cardiovascular disease and all-cause mortality regardless of body mass index: a cohort study. *Int J Cardiol* 2013; 168: 946–52.
22. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Info Libr J* 2009; 26: 91–108.
23. Godefrooij M, Spigt M, van der Minne W *et al.* Implementing cardiometabolic health checks in general practice: a qualitative process evaluation. *BMC Fam Pract* 2014; 15: 132.
24. Ismail H, Atkin K. The NHS Health Check programme: insights from a qualitative study of patients. *Health Expect* 2016; 19: 345–55.
25. Ismail H, Kelly S. Lessons learned from England's health checks programme: using qualitative research to identify and share best practice. *BMC Fam Pract* 2015; 16: 144.
26. Näslund GK, Fredrikson M, Hellenius ML *et al.* Characteristics of participating and nonparticipating men in a randomized, controlled diet and exercise intervention trial. *Scand J Prim Health Care* 1994; 12: 249–54.
27. Koopmans B, Nielsen MM, Schellevis FG *et al.* Non-participation in population-based disease prevention programs in general practice. *BMC Public Health* 2012; 12: 856.
28. Pace R, Pluye P, Bartlett G *et al.* Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. *Int J Nurs Stud* 2012; 49: 47–53.
29. Makrides L, Veinot PL, Richard J *et al.* Primary care physicians and coronary heart disease prevention: a practice model. *Patient Educ Counsel* 1997; 32: 207–17.
30. Vos HM, Adan IM, Schellevis FG *et al.* Prevention in primary care: facilitators and barriers to transform prevention from a random coincidence to a systematic approach. *J Eval Clin Pract* 2014; 20: 208–15.
31. Pelletier-Fleury N, Le Vaillant M, Hebbrecht G *et al.* Determinants of preventive services in general practice. A multilevel approach in cardiovascular domain and vaccination in France. *Health Policy* 2007; 81: 218–27.
32. Mann KV, Putnam RW. Barriers to prevention: physician perceptions of ideal versus actual practices in reducing cardiovascular risk. *Can Fam Physician* 1990; 36: 665–70.
33. Wright CA, Osborn DP, Nazareth I *et al.* Prevention of coronary heart disease in people with severe mental illnesses: a qualitative study of patient and professionals' preferences for care. *BMC Psychiatry* 2006; 6: 16.
34. Amoroso C, Harris MF, Ampt A *et al.* The 45 year old health check—feasibility and impact on practices and patient behaviour. *Aust Fam Physician* 2009; 38: 358–62.
35. Ampt AJ, Amoroso C, Harris MF *et al.* Attitudes, norms and controls influencing lifestyle risk factor management in general practice. *BMC Fam Pract* 2009; 10: 59.
36. Wan Q, Harris MF, Zwar N *et al.* Prerequisites for implementing cardiovascular absolute risk assessment in general practice: a qualitative study of Australian general practitioners' and patients' views. *J Eval Clin Pract* 2010; 16: 580–4.
37. Voogdt-Pruis HR, Beusmans GH, Gorgels AP *et al.* Experiences of doctors and nurses implementing nurse-delivered cardiovascular prevention in primary care: a qualitative study. *J Adv Nurs* 2011; 67: 1758–66.
38. Doolan-Noble F, Tracey J, Mann S. Why are there gaps in our management of those with high cardiovascular risk? *J Prim Health Care* 2012; 4: 21–9.
39. Søndergaard A, Christensen B, Mairdal HT. Diversity and ambivalence in general practitioners' attitudes towards preventive health checks—a qualitative study. *BMC Fam Pract* 2012; 13: 53.
40. Ferrante D, Konfino J, Linetzky B *et al.* Barriers to prevention of cardiovascular disease in primary care settings in Argentina. *Rev Panam Salud Publica* 2013; 33: 259–66.
41. George PP, Oh CM, Loh PT *et al.* Right-siting chronic kidney disease care—a survey of general practitioners in Singapore. *Ann Acad Med Singapore* 2013; 42: 646–56.
42. Baker C, Loughren EA, Crone D *et al.* Perceptions of health professionals involved in a NHS Health Check care pathway. *Pract Nurs* 2015; 26: 608–12.
43. Barfoed BL, Jarbol DE, Paulsen MS *et al.* GPs' perceptions of cardiovascular risk and views on patient compliance: a qualitative interview study. *Int J Fam Med* 2015; 2015: 214146.
44. Gavarkovs AG, Burke SM, Reilly KC *et al.* Barriers to recruiting men into chronic disease prevention and management programs in rural areas: perspectives of program delivery staff. *Am J Mens Health* 2016 Nov; 10(6): NP155–7. Epub 2015 Jul 23.
45. Riley R, Coghill N, Montgomery A *et al.* Experiences of patients and healthcare professionals of NHS cardiovascular health checks: a qualitative study. *J Public Health (Oxf)* 2016; 38: 543–51.
46. Krska J, du Plessis R, Chellaswamy H. Views of practice managers and general practitioners on implementing NHS Health Checks. *Prim Health Care Res Dev* 2016; 17: 198–205.
47. Williams R, Rapport F, Elwyn G *et al.* The prevention of type 2 diabetes: general practitioner and practice nurse opinions. *Br J Gen Pract* 2004; 54: 531–5.
48. Graffy J, Grant J, Williams K *et al.* More than measurement: practice team experiences of screening for type 2 diabetes. *Fam Pract* 2010; 27: 386–94.
49. Calnan M, Williams S. Coronary heart disease prevention: the role of the general practitioner. *Fam Pract* 1993; 10: 137–51.
50. Hulscher ME, van Drenth BB, Mokkink HG *et al.* Barriers to preventive care in general practice: the role of organizational and attitudinal factors. *Br J Gen Pract* 1997; 47: 711–4.
51. Grant AM, Niyonsenga T, Dion I *et al.* Cardiovascular disease. Physician attitudes toward prevention and treatment. *Can Fam Physician* 1998; 44: 780–7.
52. Steptoe A, Doherty S, Kendrick T *et al.* Attitudes to cardiovascular health promotion among GPs and practice nurses. *Fam Pract* 1999; 16: 158–63.
53. Huy C, Diehm C, Schneider S. Cardiovascular prevention at the general practitioner? First results of a study on attitudes, services, success and barriers in practice. *Dtsch Med Wochenschr* 2012; 137: 17–22.
54. Diehl K, Gansefort D, Herr RM *et al.* Physician gender and lifestyle counselling to prevent cardiovascular disease: a nationwide representative study. *J Public Health Res* 2015; 4: 534.
55. Shamseer L, Moher D, Clarke M *et al.* Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ* 2015; 349: g7647.
56. Bully P, Sánchez Á, Zabaleta-del-Olmo E *et al.* Evidence from interventions based on theoretical models for lifestyle modification (physical activity, diet, alcohol and tobacco use) in primary care settings: a systematic review. *Prev Med* 2015; 76 (suppl): S76–93.

57. Ruge T, Nyström L, Lindahl B *et al.* Recruiting high-risk individuals to a diabetes prevention program: how hard can it be? *Diabetes Care* 2007; 30: e61.
58. Long GH, Johansson I, Rolandsson O *et al.* Healthy behaviours and 10-year incidence of diabetes: a population cohort study. *Prev Med* 2015; 71: 121–7.
59. Piepoli MF, Hoes AW, Agewall S *et al.* 2016 European guidelines on cardiovascular disease prevention in clinical practice: the sixth joint task force of the European Society of cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of 10 societies and by invited experts) developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *Eur Heart J* 2016; 37: 2315–81.
60. Hiligsmann M, Wyers CE, Mayer S *et al.* A systematic review of economic evaluations of screening programmes for cardiometabolic diseases. *Eur J Public Health* 2017; 27: 621–31.
61. Dyakova M, Shantikumar S, Colquitt JL *et al.* Systematic versus opportunistic risk assessment for the primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2016; CD010411.
62. Uthman OA, Hartley L, Rees K *et al.* Multiple risk factor interventions for primary prevention of cardiovascular disease in low- and middle-income countries. *Cochrane Database Syst Rev* 2015; CD011163.
63. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *PLoS Med* 2009; 6: e1000097. doi:10.1371/journal.pmed1000097.