

*Towards successful selective prevention
of cardiometabolic diseases in primary care*

Challenges across Europe

Anne-Karien M. de Waard

Colofon

Towards successful selective prevention of cardiometabolic diseases in primary care

Challenges across Europe

PhD thesis, Utrecht University, the Netherlands

ISBN: 978-94-028-1223-7

Copyright © by A.K.M. de Waard 2018.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system of any nature or transmitted in any form of by any means without prior permission of the author, or when appropriate, the publishers of the papers.

Cover painting: Karina de Waard

Cover design and layout: Tineke Nogarede, Persoonlijkproefschrift.nl

Printed by: Ipskamp Printing, proefschriften.net

The research described in this thesis was financially supported by the European Union's Health Programme (2014-2020), joint action '663309'/ SPIM-EU.

Disclaimer

The content of this thesis represents the views of the authors only and is their sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the Consumers, Health, Agriculture and Food Executive Agency or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

Financial support by the Dutch Heart Foundation and the Julius Center for Health Sciences and Primary Care for the publication of this thesis is gratefully acknowledged.

**Towards successful selective prevention of
cardiometabolic diseases in primary care**

Challenges across Europe

*Op weg naar succesvolle selectieve preventie
van cardiometabole aandoeningen in de eerste lijn*

Uitdagingen in Europa

(Met een samenvatting in het Nederlands)

Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit Utrecht op gezag
van de rector magnificus, prof. dr. H.R.B.M. Kummeling, ingevolge het besluit
van het college voor promoties in het openbaar te verdedigen op dinsdag
4 december 2018 des middags te 2.30 uur

door

Anne-Karien Maria de Waard

geboren op 13 februari 1990

te Leiden

Promotoren: Prof. dr. N. J. de Wit
Prof. dr. F. G. Schellevis

Copromotoren: Dr. M. Hollander
Dr. ir. J. C. Korevaar

Contents

Chapter 1	General introduction	7
Chapter 2	Selective cardiometabolic prevention programmes across Europe; neither “one size fits all” nor “sine qua non”	21
Chapter 3	Selective prevention of cardiometabolic diseases: Activities and attitudes of general practitioners across Europe	43
Chapter 4	Active approach to identify individuals at high risk for cardiometabolic diseases in five European countries: no association with general practitioners’ characteristics	67
Chapter 5	Barriers and facilitators among health professionals in primary care to prevention of cardiometabolic diseases: A systematic review	79
Chapter 6	Willingness to participate in health checks for cardiometabolic diseases: a survey among primary health care patients in five European countries	121
Chapter 7	Barriers and facilitators to participation in a health check for cardiometabolic diseases in primary care: A systematic review	149
Chapter 8	Design of generic selective cardiometabolic prevention programs in primary care: consensus development using the RAND/UCLA appropriateness method	199
Chapter 9	General discussion	217
	Summary	235
	Nederlandse samenvatting	243
	Dankwoord	251
	About the author	257



Chapter 1

General introduction



'An ounce of prevention is worth a pound of cure' B. Franklin in 1736

When in 1736 the city of Philadelphia was threatened by city-wide fires, Benjamin Franklin argued that preventing the onset and spread of fire was better than fighting it. This led to the first fire department in Philadelphia.¹ Although this was already more than 300 years ago, the topic of prevention, especially in health care, is more actual than ever. Whilst in case of fire, prevention seems easy to accomplish, prevention of diseases seems not to be that easy all the time. Non-communicable diseases, such as cardiovascular disease, diabetes, cancer and chronic respiratory disease pose a major threat on both mortality and morbidity around the world. They have common risk factors originating from lifestyle and behaviour, and preventive actions tackling these risk factors could substantially decrease their disease related burden.² So far, however, prevention of non-communicable diseases has not yet been adequately incorporated in health care, and is still poorly aligned with curative health care services.

Increasing burden of cardiometabolic diseases

Cardiometabolic diseases (CMD), including cardiovascular disease (CVD), diabetes mellitus and chronic renal failure are presently the leading cause of mortality worldwide.^{3,4} The prevalence of CMD has increased rapidly over the past years, with an increase of more than 50% in many countries.^{4,5} CMD also has a major societal impact due to disease related morbidity. Around 23% of disability adjusted life-years (DALYs) in Europe are lost due to CVD.⁵ Furthermore, patients with diabetes, a history of stroke or myocardial infarction report a lower quality of life than people without these diseases.⁶⁻⁸ Finally, CMD related costs are high, with total expenditure in countries of the European Union (EU) reaching up to around €169 billion annually. This includes direct health care costs, but also costs due to productivity loss and informal care.⁹

To a large extent CMDs are caused by four lifestyle related risk factors: an unhealthy diet, physical inactivity, the use of tobacco and harmful use of alcohol.¹⁰⁻¹⁴ Since as much as 80% of CVDs and over 90% of diabetes could be prevented or postponed by improving lifestyle alone,^{15,16} there is a large window of opportunity to prevent the onset of these diseases. As CMD share these lifestyle related risk factors with other non-communicable diseases such as cancer and chronic obstructive pulmonary disease, the development of strategies

to prevent CMD could also be valuable to prevent other non-communicable diseases. However, despite the increase in the prevalence of both CVD and diabetes in the past years,^{4,5} preventive strategies have so far not yet been optimally implemented.

Preventive strategies

There are different preventive strategies, according to aim, disease and target group. The United States institute of Medicine classifies four preventive strategies according to their target population.¹⁷ **Indicated prevention** targets those already treated for their high-risk and/or experiencing early symptoms and aims at preventing the onset of a disease. **Care-related prevention** targets persons with a diagnosed disease and aims at preventing or delaying the onset of disease severity progression and complications. Indicated prevention and care-related prevention are usually considered as health care, provided by health care professionals, and are already quite well implemented.

The 2016 guideline on cardiovascular disease prevention from the European Society of Cardiology (ESC) recommends delivering prevention at both the population level as well as at individual level for persons at high CVD risk.¹⁵ **Universal prevention** targets the general population and is not directed at a specific risk group. Universal prevention of CMD at the level of the population level aims at changing behaviour across large populations. This could be accomplished by for example health education, mass media campaigns and legislative barriers. Increasingly, attention is paid to universal prevention, especially on policy level, with for example smoking bans in public places, and a 'sugar tax' on soft drinks.^{18,19}

More challenging however, is the prevention of the onset of non-communicable diseases on individual level. **Selective prevention** targets at asymptomatic persons at high risk of CMD, and interventions to lower their risk. If individuals at high risk of CMD could be identified efficiently within the population, targeted interventions can be started to decrease their risk and prevent CMD. Early detection and treatment of type 2 diabetes have been shown to reduce cardiovascular morbidity and mortality,²⁰ the use of statins to lower cholesterol levels was demonstrated to reduce both mortality and vascular morbidity, also in individuals without CVD,²¹ and the use of antihypertensive medication reduces the risk of cardiovascular events such as stroke, coronary heart disease and all-cause mortality.²²

Furthermore, we know that risk factors for CMD can be reduced by encouraging people with an increased risk to change their lifestyle.^{23,24} Selective prevention therefore seems a promising strategy to prevent CMD, but implementation in clinical practice is challenging.

The strategy of selective prevention consists of two steps: an identification phase during which individuals with a high CMD risk are detected using a risk assessment tool, followed by a treatment phase in case of an established high risk and treatable risk factors such as smoking, hypertension, increased cholesterol level and obesity.²⁵ The first phase of risk identification is conditional to start interventions, as treatment is only indicated in high-risk individuals. The first hurdle in this field is therefore how to efficiently identify individuals at high risk from the general or consulting population. In this thesis, we will mainly focus on this first identification step. One way of identifying individuals at risk is by using a CMD risk assessment tool in a selected patient group that is invited for a 'health check'.

According to the ESC guideline, these CVD health checks are the optimal scenario for adults to have their risk assessed.¹⁵ The ESC guideline recommends implementing an active screening for increased CVD risk in men above 40 years and in women above 50 years of age at least every five years. However, although the evidence for the impact of reducing intermediate risk factors on CMD morbidity and mortality is convincing,^{20,21} so far the scientific evidence for the (cost) effectiveness of selective CMD prevention programmes is scarce and inconclusive and there are hardly any trials assessing the effectiveness of selective CMD prevention programmes.

A Cochrane review from 2012 concluded that 'health checks' had no effect on CVD related morbidity and mortality²⁶ and a study on community based screening and lifestyle counselling did not show an effect on the incidence of ischemic heart disease, stroke or mortality on population level.²⁷ On the other hand, a review on effectiveness of general practice based health checks did show improvement of surrogate outcomes such as blood pressure, body mass index (BMI) and total cholesterol levels, especially among high-risk patients.²⁸ Also, a community and primary care-based screening and intervention programme did demonstrate to decrease blood pressure, glucose and smoking rates.²⁹

Despite the lack of consistent evidence for the effectiveness of CMD prevention programmes, many professionals agree about the need for them. Guidelines from several professional organisations, such as the ESC guideline,¹⁵

National Institute for Health and Care Excellence (NICE)³⁰ and the national College of General Practitioners in the Netherlands³¹ recommend to actively screen for CMD risk. However, there seems to be a wide variety in practice, and large differences in implementation of these health checks across Europe.

Challenges for implementing selective prevention

To accomplish successful implementation of selective prevention of CMD, it is essential to tackle the major challenges that currently arise in clinical practice around Europe.

Who should implement selective prevention of CMD?

One of the challenges is who should implement selective prevention of CMD. Since selective prevention targets to identify those at high risk among asymptomatic individuals, this could be the domain of both public health and primary care.

For various reasons, general practice could be the optimal environment for implementation of selective prevention. As stated in the ESC guideline: 'General practitioners (GPs) have a unique role in identifying individuals at risk of, but without established CVD, and assessing their eligibility for intervention'.¹⁵ In most countries, GPs have a longstanding and continuous relationship with their patients and they are up to date with their medical history,³² which may facilitate patient participation. Furthermore, GPs are in the position to explain about CMD risk, to refer to lifestyle treatment and to prescribe medication if indicated. Currently it is unclear to what extent GPs are already involved in providing selective prevention of CMD and whether they feel responsible to be involved in these tasks in the future.

Given the different role of GPs as well as public health in different countries, it is likely that these two groups of health professionals play a different role in selective prevention of CMD in various countries. Whilst we acknowledge the important role public health could play in selective prevention, in this thesis the focus will be on the role of the GP.

What is the target population for selective CMD prevention?

The next challenge is to define the target population, so who should be invited for a CMD risk assessment. The ESC guideline recommends inviting men above the age of 40 and women above the age of 50,¹⁵ but also other age ranges

could be used to select the target population. Lowering the age threshold has the advantage that more individuals will be screened and that in total, a higher number of high risk individuals will be identified. At the same time, since the risk is lower in younger age groups, the number needed to screen will increase in case of a lower age threshold, leading to a diminished net effectiveness of the prevention programme. It is therefore important to strive for a good balance between efficiency and effectiveness when defining the characteristics and the age threshold for the target population.

How to involve the target population in selective prevention for CMD?

The third challenge is to achieve optimal compliance among the target population. Only if the majority responds to the invitation and actively participates in the risk assessment, it is possible to effectively identify and treat individuals at high risk. In addition, it is important that especially those with an increased risk participate. One of the side effects of prevention programmes is that they might attract the 'worried well', in other words: persons with an already healthy life style looking for confirmation of their low prior risk. From the literature we know that people with the largest need for medical care, are the least likely to receive it, which is known as the "inverse care law".³³ It is therefore important to identify barriers for individuals to participate, especially to reach the ones that need it the most, and to overcome these barriers to maximise participation in selective prevention.

How to adequately facilitate selective prevention of CMD in the health care system?

A vital condition for successful implementation of selective CMD prevention programmes is to get the required prioritisation and involvement of policy makers. There are several key conditions for optimal implementation of selective prevention programmes, which do not only relate to the identification of individuals at risk but also the embedding in society as a whole. These factors include for example funding, dedicated time for doctors to perform these activities, clarity about who is responsible for the execution, but also lifestyle interventions. Currently, policymakers often have inadequate perspectives on how well CVD goals in their county have been reached, and actions are needed to improve this.³⁴ More insight for politicians and policy makers in the need for CMD prevention for population health is essential to provide a starting point for (further) implementation of selective CMD prevention.

The increasing epidemic of CMD; a European challenge

All European Union (EU) Member States face the challenge of how to tackle the ever increasing epidemic of CMDs.^{5,35} As one of the aims of the EU is to: 'Promote health, prevent disease and foster healthy lifestyles through health in all policies',³⁶ joint initiatives regarding selective prevention programmes could be a promising strategy to achieve these aims. The development of European guidelines for quality assurance in colorectal cancer screening and diagnosis, has led to a significant improvement of the availability of colorectal cancer screening in EU countries.³⁷ Analogously, a uniform, pan- European strategy could boost the implementation of CMD prevention programmes in different countries.

Despite its importance, currently there is no EU wide policy for selective prevention of CMD and there is no adequate overview of the current practice and programmes in different countries. The organisation of (primary) health care, its involvement in prevention as well as the political and cultural context differs across the different EU countries.^{38,39}

More insight in current practices in different countries could help to find best practices, as well as barriers and facilitators for selective prevention of CMD. This provides the opportunity for countries to learn from each other's experiences and to provide recommendations on how to optimise CMD prevention across Europe.

In this thesis, we will study the current status of selective prevention of CMD in individual countries and will provide a European overview of ongoing CMD prevention initiatives. To get a better insight in contextual factors, we will study five countries in more detail: the Czech Republic, Denmark, Greece, the Netherlands and Sweden. These countries have different health care systems, and a different cultural and geographical background. More insight in the public and professional commitment in these countries could serve as a starting point for implementation of selective prevention across Europe. The variation across Europe offers a unique opportunity to learn from best practices and to define characteristics and conditions of optimal implementation, which could form the basis for a EU wide policy.

Aim of this thesis

In this thesis, we aim to assess the present status of CMD implementation programmes across Europe, and to study barriers and facilitators on different levels: the health care system, health care providers and the target population.

Research objectives:

1. On health care system level: To provide information on the current status of the implementation of health checks for CMD across Europe and on conditions to facilitate the implementation;
2. On health care provider level: To give more insight in the current activities and barriers and facilitators for GPs to invite their patients for a CMD health check, as well as their attitude towards selective prevention of CMD;
3. On population level: To examine willingness of the target population to participate in a health check for CMD as well as barriers and facilitators for participation.

Outline of this thesis

In *chapter 2* we will describe the existing selective prevention programmes in the 28 EU member states. Chapters 3, 4 and 5 focus on the health care provider level and describe the results of a survey among GPs in five EU member states about the current activities of GPs in selective prevention of CMD (*chapter 3*). In *chapter 4* we describe the characteristics of GPs that are related to selective preventive activities and the preferred organisation of selective prevention according to GPs. In *chapter 5* we describe a systematic literature review on barriers and facilitators for professionals in primary care to perform selective prevention of CMD. Chapters 6 and 7 focus on the population level. *Chapter 6* describes the willingness of the target population from five countries to participate in the first step of a CMD prevention programme: a health check to identify individuals who are at risk for disease. *Chapter 7* describes a systematic literature review on barriers and facilitators for individuals to participate in a health check for CMD in primary care. The results of these chapters were used to design guiding statements on selective prevention programmes, using the RAND-UCLA method. The results of this synthesis are described in *chapter 8*. This thesis closes with a general discussion and summary of the main findings and provides recommendations for the organisation of selective prevention of CMD within Europe and suggestions for further research.

References

1. Kiel D. An ounce of prevention is worth a pound of cure: Reframing the debate about law school affirmative action. *Denv.UL Rev.* 2010;88:791.
2. WHO (World Health Organization). Global action plan for the prevention and control of noncommunicable diseases 2013-2020. Available at: http://apps.who.int/iris/bitstream/handle/10665/94384/9789241506236_eng.pdf?sequence=1. Accessed 06/15, 2018.
3. WHO. Cardiovascular diseases. 2016; Available at: <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed 06/15, 2018.
4. Nichols M, Townsend N, Scarborough P, Rayner M. Cardiovascular disease in Europe: epidemiological update. *European Heart Journal* 2013;34(39):3028-3034.
5. Atlas Writing Group, Timmis A, Townsend N, Gale C, Grobbee R, Maniadakis N, et al. European Society of Cardiology: Cardiovascular Disease Statistics 2017. *Eur Heart J* 2018 Feb 14;39(7):508-579.
6. Rubin RR, Peyrot M. Quality of life and diabetes. *Diabetes Metab Res* 1999;15(3):205-218.
7. Dhamoon MS, Moon YP, Paik MC, Boden-Albala B, Rundek T, Sacco RL, et al. Quality of life declines after first ischemic stroke. The Northern Manhattan Study. *Neurology* 2010 Jul 27;75(4):328-334.
8. Schweikert B, Hunger M, Meisinger C, König HH, Gapp O, Holle R. Quality of life several years after myocardial infarction: comparing the MONICA/KORA registry to the general population. *Eur Heart J* 2009 Feb;30(4):436-443.
9. Leal J, Luengo-Fernández R, Gray A, Petersen S, Rayner M. Economic burden of cardiovascular diseases in the enlarged European Union. *Eur Heart J* 2006;27(13):1610-1619.
10. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010 Jan;87(1):4-14.
11. James WP. The epidemiology of obesity: the size of the problem. *J Intern Med* 2008 Apr;263(4):336-352.
12. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001 Nov 27;104(22):2746-2753.
13. Deaton C, Froelicher ES, Wu LH, Ho C, Shishani K, Jaarsma T. The global burden of cardiovascular disease. *Eur J Cardiovasc Nurs* 2011 Jul;10 Suppl 2:S5-13.
14. WHO. World Population Ageing 1950-2050. 2002; Available at: <http://www.un.org/esa/population/publications/worldageing19502050/>. Accessed 02/24, 2017.

15. Piepoli MF, Hoes AW, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practiceThe 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
16. Perry IJ. Healthy diet and lifestyle clustering and glucose intolerance. *Proc Nutr Soc* 2002 Nov;61(4):543-551.
17. Mrazek PJ, Haggerty RJ, editors, Committee on Prevention of Mental Disorders. Institute of Medicine. *Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research*. Division of Biobehavioral Sciences and Mental Disorders. Washington, DC: National Academy Press; 1994.
18. European Commission. Tobacco. 2016; Available at: https://ec.europa.eu/health/tobacco/overview_en. Accessed 05/28, 2018.
19. HM Revenue & Customs. Check if your drink is liable for the Soft Drinks Industry Levy. 2018; Available at: <https://www.gov.uk/guidance/check-if-your-drink-is-liable-for-the-soft-drinks-industry-levy>. Accessed 07/04, 2018.
20. Herman WH, Ye W, Griffin SJ, Simmons RK, Davies MJ, Khunti K, et al. Early Detection and Treatment of Type 2 Diabetes Reduce Cardiovascular Morbidity and Mortality: A Simulation of the Results of the Anglo-Danish-Dutch Study of Intensive Treatment in People With Screen-Detected Diabetes in Primary Care (ADDITION-Europe). *Diabetes Care* 2015 Aug;38(8):1449-1455.
21. Taylor F, Huffman MD, Macedo AF, Moore TH, Burke M, Davey Smith G, et al. Statins for the primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2013 Jan 31;CD004816.(1).
22. Etehad D, Emdin CA, Kiran A, Anderson SG, Callender T, Emberson J, et al. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. *Lancet* 2016 Mar 5;387(10022):957-967.
23. Carlsson AC, Wandell PE, Gigante B, Leander K, Hellenius ML, de Faire U. 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 Sep 30;168(2):946-952.
24. van den Brekel-Dijkstra K, Rengers AH, Niessen MA, de Wit NJ, Kraaijenhagen RA. Personalized prevention approach with use of a web-based cardiovascular risk assessment with tailored lifestyle follow-up in primary care practice--a pilot study. *Eur J Prev Cardiol* 2016 Mar;23(5):544-551.

25. Engelsen C, Koekkoek PS, Godefrooij MB, Spigt MG, Rutten GE. Screening for increased cardiometabolic risk in primary care: a systematic review. *Br J Gen Pract* 2014 Oct;64(627):e616-26.
26. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
27. Jorgensen T, Jacobsen RK, Toft U, Aadahl M, Glumer C, Pisinger C. Effect of screening and lifestyle counselling on incidence of ischaemic heart disease in general population: Inter99 randomised trial. *BMJ* 2014 Jun 9;348:g3617.
28. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.
29. Eliasson M, Eriksson M, Lundqvist R, Wennberg P, Soderberg S. Comparison of trends in cardiovascular risk factors between two regions with and without a community and primary care prevention programme. *Eur J Prev Cardiol* 2018.
30. NICE guideline. Cardiovascular disease: risk assessment and reduction, including lipid modification. 2016; Available at: <https://www.nice.org.uk/guidance/cg181/chapter/Key-priorities-for-implementation>. Accessed 07/10, 2018.
31. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
32. WHO regional office for Europe. Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. 2012; Available at: <http://www.euro.who.int/en/publications/abstracts/action-plan-for-implementation-of-the-european-strategy-for-the-prevention-and-control-of-noncommunicable-diseases-20122016>. Accessed 07/04, 2018.
33. Hart JT. The inverse care law. *Lancet* 1971 Feb 27;1(7696):405-412.
34. Gyberg V, Ryden L. Policymakers' perceptions of cardiovascular health in Europe. *Eur J Cardiovasc Prev Rehabil* 2011 Oct;18(5):745-753.
35. Eurostat. Government expenditure on health. 2018; Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Government_expenditure_on_health. Accessed 05/28, 2018.
36. European Commission. EU Health Programme. 2014; Available at: https://ec.europa.eu/health/funding/programme_en. Accessed 07/12, 2018.
37. European Colorectal Cancer Screening Guidelines Working Group, von Karsa L, Patnick J, Segnan N, Atkin W, Halloran S, et al. European guidelines for quality assurance in colorectal cancer screening and diagnosis: overview and introduction to the full supplement publication. *Endoscopy* 2013;45(1):51-59.

38. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.
39. Schafer WL, Boerma WG, Spreeuwenberg P, Schellevis FG, Groenewegen PP. Two decades of change in European general practice service profiles: conditions associated with the developments in 28 countries between 1993 and 2012. *Scand J Prim Health Care* 2016;34(1):97-110.







Chapter 2

*Selective cardiometabolic prevention
programmes across Europe;
neither “one size fits all” nor “sine qua non”*

Monika Hollander*, Anne-Karien M. de Waard*, Joke C. Korevaar, Bohumil Seifert, Christos Lionis, Axel Carlsson, Jens Soendergaard, Niek J. de Wit and François G. Schellevis

** Both authors contributed equally to the manuscript*

Submitted

Abstract

Introduction: Selective prevention programmes could substantially contribute to a decrease in cardiometabolic diseases (CMD), but their impact depends upon the extent to which they are implemented and conducted. Currently, an overview on the availability and organization of selective CMD prevention programmes across Europe is lacking.

Design: A cross-sectional study within the framework of the SPIMEU project using two structured questionnaires was distributed among experts in the field of CMD prevention across all 28 European Union (EU) member states.

Results: In total 19 selective prevention programmes for CMD were identified in 16 EU countries. Programmes were present in 70% of the countries with a strong primary care, as compared to 50% of the countries in which primary care had a less strong position. The age range of the target population varied and the programmes included a varying combination of multiple steps including questionnaire, laboratory tests, physical examination, treatment and follow-up. Primary health care providers were involved in the execution of the majority of the programmes. The financial coverage of the programmes was heterogeneous, but mostly by health care insurance. In the majority of the countries a bi- or tripartite combination of primary health care providers, public health organizations and policy makers was involved in the policy and development of CMD prevention with health care providers and policy makers being the most intensely involved parties.

Conclusion: We could not identify a “best practice” modus of policy making, programme development or execution that is conditional for currently existing CMD prevention programmes. Apparently, there is neither a “one size fits all” way nor a “sine qua non” for organizing selective CMD prevention programmes. These findings indicate that in each health care system, CMD prevention programmes are feasible and that it is very important to customize the (organization of the) programme to the national context.

Introduction

Due to an increase in unhealthy lifestyle and ageing, many societies face an upcoming epidemic of cardiometabolic diseases (CMD) such as cardiovascular disease (CVD) and diabetes mellitus. Prevention programmes, aimed at the identification and treatment of persons at high risk of CMD, are urgently needed to bend this trend. According to the current guideline of the European Society of Cardiology (ESC) on cardiovascular disease prevention, both a population-based approach and an approach targeted at those at high of CMD risk could be used. Prevention should be carried out in all layers of the health care organization and surrounding societal domains, while general practitioners (GPs) are suggested to play a central role.¹

According to the ESC guideline, systematic screening is preferred over opportunistic, preferably in those persons with a possibly higher prior CMD risk such as those with a family history of premature CVD, women with a history of CMD morbidity during pregnancy and persons older than 40 years.¹ Furthermore, the guideline recommends that men above the age of 40 and women over 50 are actively screened for an increased risk of CMD at least once every five years.

Following these recommendations, selective prevention programmes should be implemented on the national level, aiming to identify persons with a high risk among those without previous CMD or known risk factors. Currently, an overview on the availability and organization of selective CMD prevention programmes across Europe is lacking. More insight into current practices in different countries could help to identify best practices, which provides the opportunity for countries to learn from each other's experiences and to give recommendations on how to optimise CMD prevention across Europe. The availability of programmes may depend on several country-specific conditions, such as strength of primary care, level of guideline development and the percentage of gross domestic product spent on health care. Also, a high national CVD mortality rate may urge the implementation of selective CMD prevention.

In this study, we aim to get an overview of the availability, content and organisation of selective CMD prevention programmes across Europe, and to identify "best practices". From this overview, an optimal way of organizing CMD prevention may be identified with descript roles for policy makers, medical, and public health professionals, that could be used as a starting point for implementation of the ESC recommendations across Europe.

Methods

This study was performed in the framework of the SPIMEU project which is a primary care based European Union (EU) funded project in five European countries (the Czech Republic, Denmark, Greece, the Netherlands and Sweden). The aim of SPIMEU is to contribute to the reduction of CMDs through constructing a toolbox that EU member states can use for implementing selective CMD prevention, customised to the local situation.²

Study Design and data collection

We performed a descriptive study between November 2015 and September 2016, among keypersons and CMD experts across all European Union (EU) member states using two structured questionnaires. We developed the questionnaires based on expert opinion within the SPIMEU project group. The questionnaires were provided online and tested by all five SPIMEU partners before final distribution. In order to cover all EU countries, each SPIMEU partner identified one keyperson in the field of CMD prevention in 5-6 surrounding EU member states. Each keyperson received a link to an online questionnaire (questionnaire 1) about the organization *in general* of selective CMD prevention in their country. We asked the keypersons to identify up to 5 other CMD experts or coordinators of selective CMD prevention programmes in their country, who were asked to complete online questionnaire 2. For ease of reading this article, we will further use the term 'prevention' to refer to 'selective prevention of CMD'.

Questionnaires

Questionnaire 1: Keypersons filled out questions on who, *in general* in their country, is responsible for the policy, development (e.g. guideline development), execution and financing of CMD prevention programmes. In case no programme was available, respondents had the option to fill out "I don't know", or to indicate who hypothetically would be responsible for the different parts. We aimed at at least one completed questionnaire per country. In case of multiple keypersons and conflicting answers, we reported a party to be involved if one or more of the keypersons indicated so. When the keypersons were familiar with an existing CMD selective prevention programme in their country they were invited to fill out questionnaire 2 to collect information about this specific programme.

Questionnaire 2: We asked national CMD experts to indicate if a selective CMD prevention programme was present (yes or no) in their country. A programme was defined as: a prevention programme, targeted to identifying and treating individuals or a population subgroup without CMD whose risk of developing CMD is significantly higher than average. In case of a positive answer, we asked them to fill out questions on the aim, target population and content of the programme (identification step, questionnaire, physical examination, laboratory testing, intervention and follow-up). Furthermore, we asked who was responsible for the policy, development, execution and payment of the specific programme.

Analysis

The results are presented in tables and figures. We analysed several factors that might be associated with the presence of a CMD prevention programme:

1. Strength of primary care (PC: strong/medium/weak). The strength of the PC system within a country has been assessed previously based on different dimensions of primary care such as the governance and economic conditions, the accessibility, continuity and coordination of primary care.³
2. Method of guideline development, i.e. central (led by central coordination) or otherwise (mixed; centrally coordinated processes with contribution from multiple actors, or no overarching structure; multiple actors producing guidance without central coordination).⁴
3. Percentage of Gross Domestic Product (% GDP) spent on health care. We divided % GDP in tertiles: low (5.0-6.9%), middle (7.2-9.2%) or high (9.5%-11.0%).⁵
4. Standardised death rate circulatory diseases: death rate of the population due to CVD adjusted to a standard age distribution. We divided the standardised death rate in tertiles: low (202.9-309.9), middle (310.1-451.3) or high (591.4-1131.0) death rate.⁶

Results

A total of 36 keypersons responded from all 28 EU member states. In most countries one keyperson responded. In Austria, the Czech Republic and Greece two keypersons responded, in Romania three and in Slovenia four. We approached 189 CMD experts suggested by the keypersons and using our own network, covering all 28 countries. From these, 66 experts (35% of total

approached) from 26 countries (93%) responded. Only the CMD experts from Finland and Ireland did not respond.

Presence of prevention programmes

In total, 19 unique prevention programmes were reported by 26 CMD experts from 16 countries, covering 62% of 26 EU member states (Table 1, supplementary file 2). Countries with a strong primary care system more often reported the presence of one or more programmes, as compared to countries in which primary care had a less strong position. (70% versus 50%, respectively). A programme was reported in 80% of the countries with a high death rate, in 38% with medium and in 63% of the countries with a low death rate. Table 1 shows that the presence of programmes did not differ across the different levels of GDP spent on health care and mode of guideline development.

Characteristics of the prevention programmes

The age range of the target population of the identified prevention programmes varied, with a variation of the lower age threshold from 14 to 50 and the upper threshold from 45 to the oldest age. Most programmes (n=17, 89%) were ongoing and were designed with multiple steps: an identification step (95% of all programmes), a risk assessment questionnaire (79%), physical examination and laboratory testing (both 95%, see Table 2). Almost all programmes offered interventions for those identified with a high risk (89%), including a follow-up system (79%). Primary health care providers were involved in the execution of the majority of the programmes (95%) (Table 2). In Croatia, Denmark and the Netherlands they collaborated with public health.

Ten of the 19 programmes (53%) were integrally financed by a single funding organisation; health care insurance in Bulgaria, the Czech Republic, Germany, Lithuania, Poland, Slovakia and Slovenia, governmental organisations in Hungary and as regular care in Portugal. In five programmes different parts of the programme were financed by different sources. For three programmes the funding was unknown or unclear (in Croatia and Spain).

Responsible parties for prevention

Prevention policy in general

In the 16 countries with a prevention programme, health care providers (n=14, 88%), policy makers (n=14; 88%) and public health organizations (n=10; 63%)

were in general involved in the national CMD prevention policy. In ten countries this concerned three parties and in Bulgaria, Croatia and the Netherlands two parties (health care providers and public health organisations) were involved (Supplementary file 1a). In two countries (13%) only one party was involved: health care providers in Lithuania and policy makers in Slovakia.

Development of prevention programmes in general

In the countries with a prevention programme, health care providers (n=13, 82%), public health organizations (n=11, 69%) and policy makers (n=13, 82%) took part in the development. In ten countries (63%) the tripartite combination of all above-mentioned parties was responsible for the programme development. Two parties were involved in two countries (17%). Only one organization was responsible for the development in three countries (19%): health care providers in Lithuania and the Netherlands and policy makers in Slovakia.

Execution of prevention programmes in general

In the majority of the countries with a programme, health care providers (n=14, 88%) and public health organizations (n=11, 69%) were involved in the execution of the programmes.

Funding of prevention programmes

Among EU countries with a prevention programme, the programme was most often funded by health care insurance (n=8, 50%) and followed by policy makers (n=7, 44%), public health organizations (32%), and patients (13%). In eight (29%) of all 28 EU countries the funding source was reported as unclear: in four countries with a programme (25%) and in four countries without a programme (33%). For Lithuania and Cyprus no information was provided about the payment.

Discussion

Main findings

In almost two-thirds of the EU countries programmes for prevention of cardiometabolic disease are available; we identified 19 prevention programmes in 16 EU countries. The majority of the programmes include a risk assessment questionnaire, physical examination and a laboratory test. Almost all programmes offer interventions for those identified with a high risk. Prevention programmes are most prevalent in counties with a strong primary care system. In the

majority of the EU countries, a bi- or tripartite combination of primary health care providers, public health organizations and policy makers was involved in the policy and development of selective CMD prevention programmes with a predominance of primary health care providers and policy makers. Primary health care workers, followed by public health organizations most often executed the programmes. Obviously, programmatic CMD prevention is a shared responsibility. This involvement of several parties highlights the complexity of the organization of selective CMD prevention programmes and may have the drawback that no single organisation feels the integral responsibility thereby weakening the implementation.

In general, the field of selective prevention programmes for CMD across Europe is heterogeneous, with different availability of programmes across countries, including countries without a programme and with more than one programme. Furthermore the organisation of the programmes varies, for example in the age range of the target population and their involvement of a variety of stakeholders in the organisation.

The variation in the way CMD prevention is organized across Europe aligns with Legido-Quigley and colleagues who mapped the regulatory basis and development of clinical guidelines in 2012.⁴

They demonstrated a wide variation between countries in the way clinical guidelines were developed and implemented. We observed similarly varying combinations of cooperation between policy makers, health care workers and public health organizations. Our observation that in the majority of the EU countries, policy makers were involved in the policy for and development of CMD prevention guidelines could be positive if we aim to improve CMD prevention. However, involvement of policy makers is no guarantee for successful implementation of CMD prevention programmes since Legido-Quigley et al reported that the value of a legal mandate for clinical guidelines was inconclusive.⁴ They showed that some countries had laws on guideline development and implementation that were not always implemented whereas highly developed systems existed and functioned without any legal basis. This may explain why we failed to observe more programmes among countries with a centrally coordinated guideline implementation. In our study, we did not ask what the exact role of policy makers was and could therefore not distinguish between legislation or their practical involvement in the process of CMD prevention.

We observed more programmes in countries with a strong primary care system and primary health care providers were often involved in the execution of the programmes. Primary care plays an important role since GPs work in the community and - especially in systems with enlisted patients - have an updated overview of their medical background. Second, GPs have longstanding and personal relationships with their patients, making primary care an obvious provider of prevention programmes. As programmes were also available in a considerable proportion of countries with a less strong primary care system, a strong primary care is not a "condition sine qua non".

There seemed to be no relation between high GDP spent on health care and guideline development and the availability of a programme and the relation with CVD death rate was inconclusive. This implies that other factors than these probably contribute to the decision to implement CMD prevention programmes in a country.

Strengths and weaknesses

To our best knowledge, this is one of the first studies to map the organization of selective CMD prevention programmes in Europe. By using our extensive network and the identification of keypersons and experts across Europe, we were able to retrieve a substantial volume of information about selective CMD prevention programmes from experts in the field covering the majority of the EU member states. However, we may have missed some programmes since the response rate was suboptimal (35%). Further, our study does not provide information about whether the programmes have been actually implemented in practice in a sustainable way. The results on the organization and policy on selective CMD prevention in general should be interpreted cautiously since they were based on the opinion of mostly one single keyperson per country and we did not test the reproducibility of their answers.

Conclusion and recommendations

In almost two-thirds of all EU countries, selective CMD prevention programmes were available and the organization is clearly a shared responsibility of policy makers, public health and primary care. A strong primary care seems to be a stimulator of prevention programmes. Based on the scattered patterns, we could not identify a "best practice" mode of policy making, programme development or execution that is conditional for currently existing programmes. Apparently,

there is neither a “one size fits all” way nor a “sine qua non” for organizing selective CMD prevention programmes.

These findings indicate that in different health care systems, CMD prevention programmes are feasible and that it is important to customize the (organization of the) programme to the national context.

In order to comply to the recommendations in the ESC guideline, efforts should be put in upscaling of existing programmes and distributing selective CMD prevention programmes to countries where they are presently unavailable, taking the national context into account.

Ethical approval: For this type of research, no approval from an ethics committee was needed.

Table 1. Aim and targets of identified selective CMD prevention programmes, including characteristics per country

Country	Name of the programme (number)	Target population	PC strength	Guideline developm.	% GDP	Circ. death rate
Austria	No programme				10.3	418.1
Belgium	No programme				10.5	281.9
Bulgaria	No name (1)	Age 30-80, BMI more than 25			8.2	1131.0
Croatia	Love your heart, regional program in Istria, Croatia (2)	NE1: Men and women, age 40 + NE2: Men and women, age 40 – 75			7.4	678.6
Croatia	No name (3)	Men and women who did not contact the physician for 3 or more years., age 50+			7.4	678.6
Cyprus	No programme				6.8	351.8
Czech Republic	The decree 70/2012 Ministry of health (4)	Age 19+, men and women			7.2	615.2
Denmark	Your Life Your Health (5)	Men and Women Age 45- 69			10.3	256.6
Estonia	No programme				6.5	699.6
Finland	Missing				9.5	378.8

Table 1. Continued

France	No programme			11.0	202.9
Germany	Gesundheitsuntersuchung nach § 20 SGBV (6)	Men and women Age 35 +		11.2	403.5
Greece	No programme			8.4	381.4
Hungary	Hungarian National Cardiovascular Programme (7)	Men and women Age 14-99		7.2	761.5
Hungary	No name (8)	Obese or overweight patients, age 18-80		7.2	761.5
Ireland	Missing			7.8	309.9
Italy	No programme			9.0	310.1
Latvia	No programme			5.7	882.7
Lithuania	Lithuanian High Cardiovascular Risk (LitHiR) primary prevention programme (9)	Men and women without overt CVD NE1: Men: age 40 -54 Women: age 50-64 NE2&3: Men : age 40-55 Women: age 50-65.		6.5	848.8
Luxembourg	No programme			6.1	296.9
Malta	No programme				372.4
the Netherlands	Prevention Consult (10)	NE1: Men and women Age 40+ NE2: Men and women Age 45+		10.6	271.7
the Netherlands	Persoonlijke Gezondheidscheck (Personal health check) (11)	Men and women Age 30+		10.6	271.7
Poland	Program Prewencji Chorb Sercowo-Naczyniowych financed by NFZ (National Sickness Found) (12)	Men and Women Age 35-55		6.3	591.4
Portugal	No name (13)	Men and women Age 45+		9.0	305.8
Romania	365 - RCA-ul Inimii Tale (365 - Your Cardiovascular Risk Insurance) (14)	Men and women without known CV symptoms or CVD/DM/CKD Men: age 30-45 Women: age 35-50		5.0	951.3
Slovakia	Preventive checks for adults (15)	Men and women Age 40+		6.9	654.6

Table 1. Continued

Slovenia	NE1: Programme for prevention of cardiovascular and other chronic noncommunicable diseases (16) NE2: Referenčne ambulantne družinske medicine NE3: Nationwide Primary CVD Prevention Programme	NE1: In half of all practices Men: age 35-65 Women: age 45-70 In the other half of all practices: Men: age 30+ Women: age 30+ NE2: Men and women, enlisted patients, age 30+ NE3: Men and women Men: age 35 - 65 Women: age 40 - 70			8.5	451.3
Spain	Programa de actividades preventivas y de promoción de la salud (PAPPS) (17)	Men and women, age 18+			9.2	245.0
Sweden	Västerbotten Intervention Programme (VIP) (18)	NE1: Men and women Age 40-60 NE2: Men and women, Age 40,50 or 60 NE3: Men and women from local population but with high CV risk in general			11.0	338.3
United Kingdom	Health check (19)	Men and women Aged 40-65			9.9	264.9

Legend				
PC strength	Strong	Medium	Weak	Unknown
Guideline development	Central		Other	
% GDP to healthcare	High	Medium	Low	Unknown
Death rate circ. health	High	Medium	Low	

The national experts within a country are numbered when they provided different answers about the same programme.

PC strength: Strength of the primary care system as determined by Kringos et al. based on several criteria such as accessibility of primary care, comprehensiveness, governance and economic conditions.

Guideline development: Modus of guideline development, i.e. central (led by central coordination) or otherwise (mixed; centrally coordinated processes with contribution from multiple actors, or no overarching structure; multiple actors producing guidance without central coordination).

% GDP: Percentage of gross domestic product spent on healthcare

Circ. Death rate: Standardised death rate (death rate population adjusted to a standard age distribution) from diseases of the circulatory system. ³⁻⁶

BMI: body mass index; Circ.: circulatory; CKD: Chronic kidney disease; CV: Cardiovascular; CVD: Cardiovascular disease; Dev.: development; DM: Diabetes mellitus; GDP: Gross domestic product; NE: National expert PC: primary care

Table 2. Characteristics of identified selective CMD prevention programmes according to national experts

Country	No	Components	Executed by	Payed by	Payment identification/risk assessment	Payment intervention	Payment follow-up
Bulgaria	1	Q, PE, Lab, Id, int, Fup	PHCP	One source (HCI)			
Croatia	2	NE1: Don't know, int, Fup NE2: Id, Q, PE, Lab, int, Fup	NE1: PHCP NE2: PH, PHCP	NE1: Unknown (possibly IPA Adriatic EU Program funding) NE2: Different sources			
Croatia	3	Id, Q, PE, Lab	PH, PHCP	Unknown	unknown	Health Insurance	unknown
Czech Republic	4	Id, PE, Lab, int, Fup	PHCP	One source (HCI)			
Denmark	5	Id, Q, PE, lab, int, Fup	PH, PHCP	Different sources	Other organization, Municipality, Patient organization	Other organization, Municipality, Patient organization	Regional and Municipal Public Health organization
Germany	6	Id, Q, PE, Lab, int, Fup	PHCP	One source (HCI)			
Hungary	7	Id, PE, Lab, int, Fup	PHCP	Different sources	Research funding	Patient, HCI	Research funding
Hungary	8	Id, Q, PE, lab, int, Fup	PHCP	One source (national PM)			
Lithuania	9	NE1: Id, PE, int, Fup NE2: Id, Q, PE, lab, int, Fup NE3: Id, Q, PE, lab, int, Fup	NE1: PH NE2: PHCP NE3: PHCP	NE1: HCI NE2: One source (HCI) NE3: Missing			
the Netherlands	10	NE1 +2: Id, Q, PE, lab, int, Fup	NE1+2: PHCP	Different sources	NE1: Don't know NE2: Not clear, discussion	NE1+2: HCI	NE1+2: HCI

Table 2. Continued

Country	No	Components	Executed by	Paid by	Payment identification/risk assessment	Payment intervention	Payment follow-up
the Netherlands	11	Id, O, PE, lab, Int, Fup	PHCP, PH	Different sources	Not clear, discussion	Funded as regular care	Not clear, possibly funded by regular care
Poland	12	Id, O, PE, lab, Int, Fup	PHCP	One source (HCI)			
Portugal	13	Id, O, PE, lab, Int, Fup	PHCP	As regular care			
Romania	14	Id, Int	HCP	Employers for employees, patient			
Slovakia	15	Id, O, PE, lab	PHCP	One source (HCI)			
Slovenia	16	NE1 +2+3: Id, O, PE, lab, Int, Fup	NE1&2: PHCP NE3: PHCP, PH	NE1+3: One source (HCI) NE2: Different sources (national PM and HCI)			
Spain	17	Id, PE, Lab, Int, Fup	PHCP	No funding available			
Sweden	18	NE1 : O, PE, Lab, Int, Fup NE2 : O, PE, lab, Int, Fup NE3 : Id, O, Pe, Lab, int, Fup	NE1&2: PHCP NE3: Missing	NE1: One source (municipal PH) NE2 : Regional PH, regular health care NE3 : Unknown			
United Kingdom	19	Id, O, PE, Lab, Int	PHCP	One source (unknown)			

No = corresponding number of the programme as described in Table 1. When different national experts reported about the same programme, the results of both national experts are provided.

Id = identification step, O=use of questionnaire, PE=physical examination, Lab=laboratory testing, Int=intervention started if indicated, Fup=follow-up of patients, NE: National experts, PH = Public Health, PHCP = Primary Health Care Provider, HCI = Health Care Insurance, PM = Policy Makers

References

1. Piepoli MF, Hoes AW, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practiceThe 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
2. SPIMEU research team. Website SPIMEU project. 2017; Available at: www.spimeu.org. Accessed 04, 2017.
3. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.
4. Legido-Quigley H, Panteli D, Brusamento S, Knai C, Saliba V, Turk E, et al. Clinical guidelines in the European Union: mapping the regulatory basis, development, quality control, implementation and evaluation across member states. *Health Policy* 2012 Oct;107(2-3):146-156.
5. Eurostat. Government expenditure on health. 2018; Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Government_expenditure_on_health. Accessed 05/28, 2018.
6. Eurostat. Causes of death — diseases of the circulatory system. 2014; Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Causes_of_death_%E2%80%94_diseases_of_the_circulatory_system,_residents,_2014_HLTH17.png. Accessed 07/20, 2018.

Supplementary files

Supplementary file 1a. Organisation of selective CMD prevention in general according to key experts in countries with a programme

	Policy			Development			Execution			Payment		
Bulgaria	HCP	PM	PM	HCP	PH	PM	HCP	PH	PT	PM	HCI	
Croatia	HCP	PM	PM	HCP	PH	PM	HCP				HCI	
Czech Republic	HCP	PH	PM		PH	PM	HCP		PT		HCI	
Denmark	HCP	PH	PM	HCP	PH	PM	HCP	PH	PT	PH	PM	
Germany	HCP	PH	PM	HCP	PH	PM	HCP	PH		PM	PT	
Hungary	NC			NC			NC					
Lithuania	HCP			HCP			HCP				HCI	
Netherlands	HCP	PM		HCP			HCP	PH			NC	
Poland	HCP	PH	PM	HCP	PH	PM	HCP	PH	PT		NC	
Portugal	HCP	PH	PM	HCP	PH	PM	HCP	PH		PH	NC	
Romania	HCP	PH	PM	HCP	PH	PM	HCP	PH	PT	PH	HCI	
Slovakia		PM					NC				NC	
Slovenia	HCP	PH	PM	HCP	PH	PM	HCP	PH			HCI	
Spain	HCP	PH	PM	HCP	PH	PM	HCP	PH		PM		
Sweden	HCP	PH	PM	HCP	PH	PM	HCP	PH	PT	PH	PM	
United Kingdom	HCP	PH	PM	HCP	PH	PM	HCP	PH	PT	PH	PT	
											HCI	

HCP = health care provider, PH = public health, PM = policy makers, PT = patient, HCI = Health care insurance, NC = not clear

Supplementary file 1b. Hypothetical organisation of selective CMD prevention in general according to key experts in countries without a programme or missing information about the programme

Policy		Development		Execution		Payment	
Austria	HCP	PM	PM	HCP	PH	PM	
Belgium	HCP	PH	PM	HCP	PH	PM	HCI
Cyprus	HCP	PH	PM	HCP	PH	PM	
Estonia	HCP	PH	PM	HCP	PH	PM	NC
Finland	HCP	PH	PM	HCP	PH	PM	
France	HCP	PH	PM	HCP	PH	PH	HCI
Greece	HCP	PH	PM	HCP	PH	PH	NC
Ireland		PM	PM	HCP			NC
Italy	HCP	PH	PM	HCP	PH	PH	PT
Latvia	HCP	PH	PM	HCP	PH	PH	PM
Luxembourg		PM	PM	HCP	PH	PM	NC
Malta	HCP	PH	PM	HCP	PH	PH	HCI

HCP = health care provider, PH = public health, PM = policy makers, PT = patient, HCI = Health care insurance, NC = not clear

Supplementary file 2. Additional information about identified selective CMD prevention programmes

Country	No	Aim	Ongoing
Bulgaria	1	To find, follow up and treat patients with obesity, with CVD, Diabetes and hypertension, prevention of CVD and renal failure	Yes, since 2004
Croatia	2.1	To reduce risk of overweight, improve physical recreational habits, reduce smoking and stress. GP/FP were re/educated in that achieve that goal in working with population. On level of service organization, communication between parties involved, as well as data collecting and analysing are further improved.	Yes, since 2013
Croatia	2.2	Explore implementation, providing and evaluation of preventive program of cardiovascular disease in family medicine based on systematic, programmed and structured approach	No, 2009-2015
Croatia	3	To find persons with higher risk for diabetes, hypertension and cancer	Since 1995
Czech Republic	4	Physical examinations and blood pressure every 2 years. HDL, LDL cholesterol and triacylglycerol. In age 19, 30,40,50,60, glycaemia 19, from 40 every 2 years, ECG from 40 every 4 years	Yes
Denmark	5	Persons living in social deprived areas in Aarhus are invited for a Health Check and subsequently offered help to change lifestyle and medication if necessary.	Yes, since 2014
Germany	6	Detection of elevated cardiovascular risk or renal disease	Yes, since 1992
Hungary	7	Cardiovascular centres coordinated the prevention program in primary care, in secondary schools and guideline for the occupational health doctors	Yes, since 2005
Hungary	8	Screening and treating of obese patients	No, 2004-2006
Lithuania	9.1	To assess cardiovascular risk in the subjects of employable age that are still not having the clinically manifesting cardiovascular disease and after choosing those with the high risk to apply them aggressive modification and treatment of risk factors	Yes, since 2006
Lithuania	9.2	To identify persons with cardiovascular risk earlier clinical manifestation of cardiovascular diseases. Treatment of cardiovascular risk factors.	Yes, since 2015

Supplementary file 2. *Continued*

Country	No	Aim	Ongoing
Lithuania	9.3	To identify theoretically healthy persons who are at low, moderate and high risk for cardiovascular diseases	Unknown
the Netherlands	10.1	People fill out a questionnaire and in case of high risk of CVD, diabetes and/or kidney diseases they can be referred to the GP for risk factor management	Yes, since 2012
the Netherlands	10.2	Guidance for mapping the risk of CMD and kidney disease in persons > 45 years old. Persons with a risk score on the questionnaire above threshold are advised to visit the GP, followed by treatment of risk factors. Persons with a risk below threshold do not visit the GP, but receive lifestyle advice if indicated	Yes, since 2012
the Netherlands	11	Detection of people with a high risk on cardiometabolic disease, followed by lifestyle advice and treatment according to the practice guidelines	Yes, since 2011
Poland	12	To identify men and women with enhanced level of global risk and risk factors of NCD, especially with classic CVD risk factors in primary health care. To start necessary intervention, it means education, life style changes and if necessary further diagnostics and treatment.	Yes, since 2004
Portugal	13	Early detection of hypertension and diabetes	Yes, since 2005
Romania	14	Cardiometabolic risk prediction using blood tests and identification of subclinical atherosclerosis (AB-index, carotid plaques presence, +/- calcium score CT).	Yes, since 2015
Slovakia	15	To screen the population of over 40 years for arterial hypertension, diabetes, chronic kidney disease, ECG abnormalities and lipid profiles abnormalities	Yes, since 2010
Slovenia	16.1	Intervention in patients with high risk or early stage disease(s)	Yes, since 2001
Slovenia	16.2	Screening for patients at high risk for CMD, diagnose and treatment, follow up	Yes, since 2011
Slovenia	16.3	To screen the population in selected age groups on CVD risk factors and to intervene by healthy lifestyle advice to reduce the CVD risk to those identified to be at high CVD risk	Yes, since 2002

Supplementary file 2. *Continued*


Country	No	Aim	Ongoing
Spain	17	PAPPS is a national programme focused in prevention and health promotion. One of the subprogrammes is prevention of cardiovascular diseases	Yes, since 1989
Sweden	18.1	Health surveys based at Health Centres aiming at all 40-50-60 year olds	Yes, since 1985
Sweden	18.2	"The VIP is a systematic, long-term, county-wide CVD intervention" that is performed within the primary healthcare setting and combines individual and population approaches.	Yes, since 1985
Sweden	18.3	Broad screening for CV risk factors in the county of Västerbotten, northern Sweden, and in the community of Norsjö	Yes
United Kingdom	19	To call in people of middle age and identify the cardiovascular risk and try to reduce it through advice or medication if at high risk	Yes





Chapter 3

Selective prevention of cardiometabolic diseases: Activities and attitudes of general practitioners across Europe



Anne-Karien M. de Waard, Monika Hollander, Joke C. Korevaar, Mark M. J. Nielen, Axel C. Carlsson, Christos Lionis, Bohumil Seifert, Trine Thilsing, Niek J. de Wit, François G. Schellevis, on behalf of the SPIMEU project group.

Abstract

Background: Cardiometabolic diseases (CMDs) are the number one cause of death. Selective prevention of CMDs by general practitioners (GPs) could help reduce the burden of CMDs. This measure would entail the identification of individuals at high risk of CMDs –but currently asymptomatic– followed by interventions to reduce their risk. No data were available on the attitude and the extent to which European GPs have incorporated selective CMD prevention into daily practice.

Methods: A survey among 575 GPs from the Czech Republic, Denmark, Greece, the Netherlands and Sweden was conducted between September 2016 and January 2017, within the framework of the SPIMEU-project.

Results: On average, 71% of GPs invited their patients to attend for CMD risk assessment. Some used an active approach (47%) while others used an opportunistic approach (53%), but these values differed between countries. Most GPs considered selective CMD prevention as useful (82%) and saw it as part of their normal duties (84%). GPs who did find selective prevention useful were more likely to actively invite individuals compared with their counterparts who did not find prevention useful. Most GPs had a disease management programme for individuals with risk factor(s) for cardiovascular disease (71%) or diabetes (86%).

Conclusions: Although most GPs considered selective CMD prevention as useful, it was not universally implemented. The biggest challenge was the process of inviting individuals for risk assessment. It is important to tailor the implementation of selective CMD prevention in primary care to the national context, involving stakeholders at different levels.

Introduction

Cardiometabolic diseases (CMDs) are the number-one cause of death in the world.¹ They include cardiovascular disease (CVD), diabetes mellitus and chronic renal failure. CMDs are mainly caused by an unhealthy lifestyle, the major risk factors being physical inactivity, smoking and an unhealthy diet.²⁻⁶ The selective prevention of CMDs could help reduce the burden of these diseases in the general population.^{7,8} This measure would entail the identification of individuals who are at high risk of CMD but who are currently asymptomatic, followed by interventions to reduce their level of risk.

The European Society of Cardiology's (ESC) 2016 guideline on cardiovascular disease prevention recommends that men above the age of 40 and women over 50 are actively screened for an increased risk of CVD at least once every five years.⁹ So, ideally, everyone in a specific age group would be systematically and actively invited to visit their GP for a CMD health check. This would supplement whole-population interventions, such as banning smoking in public places and creating healthy environments. Scientific evaluations have produced conflicting results concerning the effect of health checks on mortality.¹⁰ Nevertheless, health checks in primary care have been shown to improve outcomes, such as reducing body mass index, blood pressure and cholesterol levels.^{7,11}

In most countries, general practitioners (GPs) have a longstanding and continuous relationship with their patients, and are up to date with their medical history.¹² Therefore, as the ESC guideline states, 'GPs have a unique role in identifying individuals at risk of, but without established CVD, and assessing their eligibility for intervention'.⁹

As yet, there are no data on how different European countries tackle the selective prevention of CMDs in primary care. Nor, indeed, is anything known about the attitudes of GPs throughout Europe towards selective CMD prevention. The aim of this present study is to summarise the current activities and attitudes of GPs in five European countries towards the selective prevention of CMDs. We will focus on the first step of selective CMD prevention, which entails the identification of individuals who are at high risk of CMD. These results could provide a starting point for the (further) development and implementation of selective CMD prevention in primary care across Europe. This study is part of SPIMEU, a project co-funded by the European Commission. The project's goal is to identify the determinants of successful selective CMD prevention in primary care across Europe.¹³

Methods

Study design and population

A survey among GPs from five European countries was conducted from September 2016 to January 2017. Invitations were sent to GPs from the countries represented in the SPIMEU project (the Czech Republic, Denmark, Greece, the Netherlands and Sweden). A representative sample of GPs from each country was invited to participate. Various methods were used for the GP selection and invitation procedure (Supplementary file 1). Our target was to collect a minimum of 500 completed questionnaires, 100 from each individual country. In short, invitations were sent to eligible GPs, either by email or by letter, asking them to complete the questionnaire. At least one reminder was sent to each GP until the target of 100 GPs per country had been reached. Where necessary, a second sample of GPs was also invited to participate. In Greece, Denmark and the Netherlands, the GPs were offered a remuneration (€25-€67) for completing the questionnaire.

Questionnaire

We developed an English, semi-structured questionnaire to identify the GPs' current activities in the area of selective CMD prevention, and to discover their attitudes on the subject. The questionnaire, which was based on a previous questionnaire developed by our group in 2008,¹⁴ consisted of five sections:

1. The GPs' characteristics;
2. statements about their attitude towards CMD prevention;
3. the methods used to identify high-risk individuals divided into an active approach (i.e. inviting individuals who are not attending the practice at that time to attend for CMD risk assessment, for example by phone or letter) or an opportunistic approach (i.e. inviting individuals who are attending for a routine consultation, for any reason);
4. the measurements made to assess the risk of CMD;
5. routine use of a disease management programme (DMP; the availability of systematic treatment) for individuals with one or more cardiovascular risk factors or with type 2 diabetes.

The questionnaire was tested by two GPs from the Netherlands, two from Greece and by each of the partners in the SPIMEU project. It was then translated into the national language of each participating country (with the exception of Sweden).

Details of the translation procedure used are given in Supplementary file 3. The questionnaire was then made available (in Czech, Danish, Dutch, English, and Greek) through an online link (in the Czech Republic, Denmark, the Netherlands, Greece and Sweden) and on paper (in Greece). The answers provided to the researchers were anonymized. An overview of the definitions used in the questionnaire and in this manuscript is provided in Supplementary file 2.

Ethical considerations and analysis

Appropriate ethical procedures were followed in all five countries. The study was approved by ethical review boards in Sweden, Greece and the Czech Republic. The ethical review boards in Denmark and the Netherlands declared that no approval was required. In the case of those questionnaires that were completed online, it was not possible to progress to the next question before the current question had been answered. As a result, proceeding from the beginning to the end of the questionnaire, the amount of data gathered decreased. We decided to include those questionnaires that contained a response to our main statement: 'Selective CMD prevention is useful'. Missing data were excluded from the analysis. SPSS version 22 was used for the purpose of descriptive analyses. Average frequencies were calculated for all countries combined, and for each individual country. Groups were compared using χ^2 tests. We considered a P-value of <0.05 to be statistically significant.

Results

Response

In all, more than 2750 GPs were invited to participate, 706 of whom started the questionnaire. A total of 575 GPs completed the questionnaire up to and including the main statement (Selective prevention is useful). These questionnaires were included in the analysis. The response rates were 9, 12, 39 and 53% for the Netherlands, Denmark, Greece and the Czech Republic, respectively. The overall response rate was 18%. We were unable to calculate a response rate for Sweden, as it was not possible to retrieve data on the number of GPs invited to participate. Overall, more female GPs completed the questionnaire than their male counterparts (45% were male; see Table 1). When we compared the gender percentages of those GPs who completed the questionnaire with the national gender percentages for GPs in each participating country, we found that these values corresponded in the cases of Denmark, the Netherlands, Greece and

the Czech Republic. In Sweden, the number of female GPs who completed the questionnaire (60%) exceeded the national percentage of female GPs (47%). The average ages of respondents in Sweden, the Netherlands and the Czech Republic were lower than the respective national average ages for GPs in these countries. In Denmark, the respondents' average age corresponded to the national average age for GPs. We were unable to obtain data on the average age of GPs in Greece (Supplementary file 4).

Table 1. Characteristics GPs and practice characteristics

	the Czech Republic n=133	Denmark n=122	Greece n=116	the Netherlands n=112	Sweden n=92	Total n=575
Male (%)	36	54	48	45	40	45
Age (%)						
< 40	47	4	43	33	27	32
40-49	22	30	42	31	34	32
≥ 50	31	66	16	36	39	37
Smoking ^a (%)	4	1	28	1	1	8
GP has CMD (%)	10	6	16	6	17	11
Self-employed ^b (%)	60	94	21	83	1	55
Location practice (%)						
Big city, suburbs	64	44	33	23	59	44
Town, mixed urban rural, rural	36	56	67	77	41	56
Type practice (%)						
Single-handed	46	22	38	21	0	28
Dual practice, group practice ^c	36	78	17	60	20	43
PC centre with many disciplines	5	0	28	18	80	22
Outpatient clinic, hospital	12	0	18	0	0	7

a: At least one cigarette per day

b: Other answer options: salaried employment or combination of self-employment and salaried employment

c: Group practice: practice with more than two GPs

GP, General practitioner; CMD, Cardiometabolic disease; PC, primary care.

Table 2. GPs' attitudes and their approach to patients in selective CMD prevention

	the Czech Republic n=133	Denmark n=122	Greece n=116	the Netherlands n=112	Sweden n=92	Total n=575
Selective prevention of CMD is useful (% agree)	93	71	92	80	71	82
Selective prevention of CMD is a waste of money (% agree)	2	10	4	6	9	6
Selective CMD prevention is part of a GP's normal duties (% agree)	91	77	96	73	83	84
Active approach (%)	69	26	53	38	45	47
Opportunistic approach (%)	67	44	66	44	39	53
Practice protocol available (%)	21	21	14	32	17	21

Attitudes of GPs towards selective CMD prevention and methods used to invite individuals to attend for risk assessment

The vast majority of GPs (overall 82%, range between countries 71 - 93%) stated that selective prevention is useful. A minority considered it to be a waste of resources (6%, range 2-10%). Almost all GPs (84%, range 73-96%) agreed that selective prevention of CMD is part of their normal duties. Greek and Czech GPs had the most positive attitude towards selective CMD prevention. Ninety-two percent of Greek GPs stated that it was useful and 96% agreed that this is part of their normal duties (see Table 2). The corresponding values for Czech GPs were 93 and 91%.

In total, 71% of GPs in these five countries indicated that they invite individuals to attend for CMD risk assessment, either using an active approach, e.g. by phone or letter (47%) or an opportunistic approach during a routine consultation (53%). On average, 29% used both active and opportunistic approaches to invite individuals to attend for CMD risk assessment.

The proportion of GPs inviting individuals to attend for risk assessment was highest in the Czech Republic (69% actively and 67% opportunistically) and lowest in Denmark (26 and 44% respectively; see Table 2). The majority of GPs who actively invite patients to attend for an initial CMD risk assessment (data not shown) base their assessment on characteristics (age, gender, family history), risk factors (physical activity, smoking), measurements (weight, height, blood

pressure), and laboratory tests (lipids, glucose). Overall, the risk factors used for CMD risk assessment were largely the same from one country to another.

Comparison of GPs with positive or negative attitudes towards selective CMD prevention

We compared the group of GPs who agreed with the statement 'Selective prevention of CMD is useful' (82%) with those who did not agree (6%) and those who answered 'I don't know' (12%; see Table 3). Significantly, more of the GPs who agreed that selective CMD prevention is useful saw it as part of their normal duties (91%) than those who disagreed (20%). Furthermore, of those GPs who agreed that selective prevention is useful, a significantly higher proportion reported that they invite patients to attend for assessment (53% actively and 59% opportunistically) than those who disagreed (20 and 17% respectively) or who did not know (22 and 26% respectively; see Table 3).

Less than one quarter of the GPs (21%, range 14-32%) indicated that their practice routinely uses a protocol for the tasks and logistics involved in selective CMD prevention. Such protocols are more commonly used by GPs who consider selective CMD prevention to be useful than by those who disagreed (23% vs 3% respectively).

Table 3. Comparison of GPs who agreed or disagreed with the statement 'Selective prevention of CMD is useful' or who answered 'I don't know'

	Selective prevention of CMD is useful			Overall p-value
	Agree n= 471	Disagree n= 35	Don't know n= 69	
Selective CMD prevention is part of a GP's normal duties (% agree)	91	20	70	<0.001
Active approach (%)	53	20	22	<0.001
Opportunistic approach (%)	59	17	26	<0.001
Practice protocol available (%)	23	3	19	0.017

DMPs and referral options

In most countries, more than 90% of the GPs confirmed that they have a DMP available for diabetic patients (the exception was Greece, where the figure was 55%). Fewer practices had DMPs available for individuals with risk factors for

CMD than for diabetes patients (from 49 to 74%), except in the Czech Republic (93%; see Table 4).

With regard to the management of CMD risk, GPs from every country in the study can refer patients to other medical and non-medical healthcare professionals. The most easily accessible of these in Denmark were the municipal health services whereas, in the Netherlands, it was pharmacists (48%). In the Netherlands and Sweden, allied healthcare professionals (dietitians or physiotherapists) and practice nurses were also readily available, as was referral to the gym in Sweden (see Table 4).

Table 4. Availability of disease management programme and consultation options

	the Czech Republic n= 133	Denmark n= 122	Greece n= 116	the Netherlands n= 112	Sweden n= 92	Total n= 575
DMPa for individuals with ≥ 1 risk factor for CMD (%)	93	72	49	74	59	71
DMP for individuals with diabetes (%)	94	94	55	95	91	86
Readily available healthcare professional for CMD risk management (% ^a)						
Medical specialist in primary care	59	28	16	8	32	29
Medical specialist in clinic/hospital	81	80	87	81	71	81
Other GPs outside practice	9	3	8	19	4	9
Allied healthcare Professionalsb	22	26	31	80	75	44
Pharmacist	6	4	6	48	5	14
Psychologist	9	12	28	31	40	23
Practice nurse	7	57	9	73	81	42
Municipal health service	2	72	16	5	7	21
Gym, other	5	24	27	19	31	20
I never refer patients for CMD management	3	5	4	0	7	3

a: Cells add up to more than 100% because more than one answer was allowed.

b: Dietician, physiotherapist etc.

DMP, disease management programme; CMD, Cardiometabolic disease; CVD, Cardiovascular disease; GPs, general practitioners.

Discussion

The aim of this study was to provide an overview of European GPs' current activities and attitudes with regard to selective CMD prevention. Most GPs consider selective CMD prevention to be useful. On average, 47% of the GPs surveyed actively invite their patients to attend for risk assessment and 21% have a selective CMD prevention protocol available in their practice. The GPs who consider selective CMD prevention to be useful differ significantly – in several respects – from those who do not share this view. They are more likely to invite individuals to attend for risk assessment, and a higher percentage of them considers this work to be part of their normal duties and has a protocol available. In all five participating countries, a substantial proportion of GPs considered selective prevention to be useful and part of their normal duties. This is in agreement with previous findings.¹⁴ A previous study showed that GPs were enthusiastic about offering health checks for CMD, and that they preferred systematic screening to case-finding.¹⁵ This indicates that motivated GPs can play a key role in selective prevention programmes. However, our survey demonstrates that, while European GPs are keen to underline the importance of their role in selective CMD prevention, their actual performance – in terms of inviting individuals to attend for risk assessment – falls far short of 100%.

The way in which primary care is organised and its involvement in prevention differ from one country to another,^{16,17} as does progress in implementing CMD prevention programmes (Supplementary file 5). For example, the Czech Republic already has a nationwide selective prevention programme, to systematically check people's CMD risk. This involves biannual invitations to those aged 18 years and above to visit their GP.¹⁸ The patients involved are reimbursed for the cost of these health checks, which are an important source of income for GPs. Proportionately more GPs invited patients to attend for risk assessment in the Czech Republic than anywhere else. This could indicate that selective prevention programmes (at national or any other level) can act as an incentive for GPs in this regard. Denmark had the lowest proportion of GPs inviting patients to attend for risk assessment, which might reflect the fact that this country has no programmes of this kind. However, 53% of the Greek GPs indicated that they actively issue invitations to patients, yet the country has no national selective prevention programme. Thus, while the availability of such programmes seems to improve GPs' readiness to engage in selective prevention, it is not a prerequisite for them to actively invite individuals to attend for risk assessment.

With respect to DMPs, we found that the Czech Republic scored well in terms of the availability of a DMP and of GPs actively issuing invitations. In Denmark, the availability of a DMP for diabetes was relatively high (94%), yet relatively few GPs in that country actively invited individuals to attend for assessment (26%). Greece had the lowest levels of availability for the two DMPs (49 and 55% respectively), yet the percentage of Greek GPs who actively issued invitations was relatively high (53%). Thus, there was no clear relationship between DMP availability and the percentage of GPs actively inviting individuals to attend for risk assessment.

Most GPs used the risk factors recommended in the SCORE chart, which is the risk assessment tool recommended in the ESC guideline for CVD prevention.^{9,19} A survey among physicians (including primary care physicians) also showed that the ESC guideline and the SCORE were the most frequently used tools in CVD prevention.²⁰ Some of the countries use an adapted score, based on the SCORE chart. For instance, Greece has the 'Hellenic SCORE', Denmark the 'Danish SCORE', and the Netherlands the 'Dutch SCORE'.²¹⁻²³

GPs have reported various barriers to selective CMD prevention. These included insufficient funding, lack of time and high workloads.²⁴ Unless these barriers can be overcome, it will be difficult or impossible to successfully implement selective CMD prevention.

One option is to reduce GPs' workloads by cutting the time they spend on preventive tasks. If nurses were to be involved, this could potentially reduce GPs' workloads. However, the scientific evidence for such an approach is inconclusive.²⁵ In countries where little use is made of practice nurses in this regard, such as Greece and the Czech Republic (9 and 7% respectively) there might be an opportunity to involve them in selective CMD prevention. In countries such as Sweden, however, nurses are already highly involved in preventive tasks (81%). Insufficient funding for selective prevention programmes could also act as a barrier. Structural funding could encourage GPs to engage in selective CMD prevention. Thus, GPs must have sufficient funding to support their activities in both the first step (identification of high-risk individuals) and the second (interventions such as DMP and chronic care). The countries in our study each have different ways of funding healthcare (Supplementary file 5). Thus, it is important to take each country's specific situation into account when considering funding options for selective CMD prevention programmes.

Another barrier may be the limited evidence for the effectiveness (and cost effectiveness) of health checks for CMD.^{7,10,26} Large-scale studies will be needed to address this issue.

Barriers could arise in both the invitation step and the intervention step. This study shows that the invitation step is the most vulnerable part of the process in this regard, as fewer than half of the GPs actively invite individuals to attend for risk assessment. The intervention step is less of a problem, as the majority of GPs already have a DMP available.

To properly understand a country's barriers and to find potential solutions, it is important to involve stakeholders at different organisational levels, and to cooperate with them. These could include insurance companies, national ministries of health, public health organisations and patient organisations. It might also be helpful to assign active roles to national colleges of general practice, such as developing procedural guidelines for selective CMD prevention.

One particularly robust aspect of this study is that we were able to collect information from 575 GPs in five countries across Europe. This enabled us to provide an overview of GPs' activities in selective CMD prevention, and of their attitudes to this effort in countries where they play different roles.¹⁷ Another strength is that we collected information on several aspects of the selective prevention process, especially the invitation step and GPs' attitudes. We also gathered data on the specific risk factors assessed and on the intervention options.

We attempted to select a sample of GPs that was as representative of their own country as possible. This involved using a different approach in each setting, and ensuring that our sample included GPs from different regions and from different types of general practice.

One limitation of this survey is the possibility of non-response bias, which could have influenced our results.²⁷ The response rates differed from one country to another, and GPs with a more positive attitude towards prevention may have been overrepresented. This could result in an overestimation of ongoing activities and positive attitudes among GPs. We also performed a complete case analysis (n=503), the results of which reflected the final results. Thus, it is unlikely that GPs who did not complete the entire questionnaire were significantly different to those that did. The average age of respondents from three of the countries in our study was lower than the corresponding national average age of GPs. We expect younger GPs to be more positive about prevention (and selective

prevention). Thus, the GPs in our study may have had a more positive view of selective prevention than is typical of GPs in their country.

In general, European GPs have a positive attitude towards CMD prevention, which they see as part of their normal duties. Such individuals are more likely to engage in CMD prevention than GPs with a negative attitude in this regard. Despite this positive attitude, however, not all GPs actively issue invitations and systematically carry out CMD risk assessments. This is even the case in the Czech Republic, which has a national, fully reimbursed, systematic selective prevention programme. Accordingly, there may be barriers that prevent GPs engaging in selective CMD prevention. A better understanding of such barriers could help in the development and implementation of selective CMD prevention. As part of the effort to develop selective prevention programmes throughout Europe, we recommend that a range of stakeholders be involved, including ministries of health, public health organisations, insurance companies, GPs (and national colleges of general practice) and – especially – highly motivated GPs.

Acknowledgments

We would like to thank all of the GPs who completed the questionnaire for their cooperation.

Next to the authors, the SPIMEU project group consists of: Agapi Angelaki, Clinic of Social and Family Medicine, School of Medicine, University of Crete, Greece; Martin J. Holzmann, Department of Medicine, Solna, Karolinska Institutet, Stockholm, Sweden; N. Král, Institute of General Practice, First Faculty of Medicine, Charles University, Prague, the Czech Republic; Jens. Søndergaard and Anders L. Sønderlund, Research Unit of General Practice, Department of Public Health, University of Southern Denmark, Odense C, Denmark; P. Wändell, Division of Family Medicine and Primary Care, Department of Neurobiology, Care Sciences and Society (NVS), Karolinska Institutet, Stockholm, Sweden.

Funding: This work was supported by the European Union's Health Programme (2014-2020), joint action '663309'/SPIM-EU.

Conflicts of interest: None declared.

Key points

- GPs are positive about the selective prevention of cardiometabolic disease (CMD)
- GPs are actively inviting patients to attend for selective CMD prevention
- Despite widely held positive attitudes, not all GPs have implemented CMD prevention
- GPs' activities in selective CMD prevention vary from one country to another
- Implementation of selective CMD prevention should be adapted to the national context

Disclaimer

The content of this article represents the views of the author only and is his/her sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the Consumers, Health, Agriculture and Food Executive Agency or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

References

1. WHO. Cardiovascular diseases. 2016; Available at: <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed 06/15, 2018.
2. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010 Jan;87(1):4-14.
3. James WP. The epidemiology of obesity: the size of the problem. *J Intern Med* 2008 Apr;263(4):336-352.
4. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001 Nov 27;104(22):2746-2753.
5. Deaton C, Froelicher ES, Wu LH, Ho C, Shishani K, Jaarsma T. The global burden of cardiovascular disease. *Eur J Cardiovasc Nurs* 2011 Jul;10 Suppl 2:S5-13.
6. WHO. World Population Ageing 1950-2050. 2002; Available at: <http://www.un.org/esa/population/publications/worldageing19502050/>. Accessed 02/24, 2017.
7. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.
8. Unal B, Critchley JA, Capewell S. Modelling the decline in coronary heart disease deaths in England and Wales, 1981-2000: comparing contributions from primary prevention and secondary prevention. *BMJ* 2005 Sep 17;331(7517):614.
9. Piepoli MF, Hoes AW, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practiceThe 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
10. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
11. Forster AS, Burgess C, Dodhia H, Fuller F, Miller J, McDermott L, et al. Do health checks improve risk factor detection in primary care? Matched cohort study using electronic health records. *J Public Health (Oxf)* 2016 Sep;38(3):552-559.
12. WHO regional office for Europe. Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. 2012; Available at: <http://www.euro.who.int/en/publications/abstracts/action-plan-for-implementation-of-the-european-strategy-for-the-prevention-and-control-of-noncommunicable-diseases-20122016>. Accessed 07/04, 2018.

13. SPIMEU research team. Website SPIMEU project. 2017; Available at: www.spimeu.org. Accessed 04, 2017.
14. Nielen MM, Assendelft WJ, Drenthen AJ, van den Hombergh P, van Dis I, Schellevis FG. Primary prevention of cardio-metabolic diseases in general practice: a Dutch survey of attitudes and working methods of general practitioners. *Eur J Gen Pract* 2010 Sep;16(3):139-142.
15. Godefrooij M, Spigt M, van der Minne W, Jurrissen G, Dinant GJ, Knottnerus A. Implementing cardiometabolic health checks in general practice: a qualitative process evaluation. *BMC Fam Pract* 2014 Jul 6;15:132-2296-15-132.
16. Schafer WL, Boerma WG, Spreeuwenberg P, Schellevis FG, Groenewegen PP. Two decades of change in European general practice service profiles: conditions associated with the developments in 28 countries between 1993 and 2012. *Scand J Prim Health Care* 2016;34(1):97-110.
17. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.
18. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.
19. European Society of Cardiology (ESC). SCORE risk chart. 2012; Available at: <https://www.escardio.org/Education/Practice-Tools/CVD-prevention-toolbox/SCORE-Risk-Charts>. Accessed 12/15, 2017.
20. Dallongeville J, Banegas JR, Tubach F, Guallar E, Borghi C, De Backer G, et al. Survey of physicians' practices in the control of cardiovascular risk factors: the EURIKA study. *Eur J Prev Cardiol* 2012 Jun;19(3):541-550.
21. DSAM. Danish Score Cart. 2007; Available at: http://www.dsam.dk/files/9/iskaemisk_hjerte_kar_sygdom_2007.pdf. Accessed 01/23, 2018.
22. Panagiotakos DB, Georgousopoulou EN, Fitzgerald AP, Pitsavos C, Stefanadis C. Validation of the HellenicSCORE (a Calibration of the ESC SCORE Project) Regarding 10-Year Risk of Fatal Cardiovascular Disease in Greece. *Hellenic J Cardiol* 2015 Jul-Aug;56(4):302-308.
23. NHG. Dutch risk table for cardiovascular risk management. 2012; Available at: <https://www.nhg.org/standaarden/samenvatting/cardiovasculair-risicomanagement>. Accessed 01/23, 2018.
24. 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 Mar 1;4(1):21-29.
25. Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B. Substitution of doctors by nurses in primary care. *Cochrane Database Syst Rev* 2005 Apr 18;(2):CD001271. doi(2):CD001271.

26. Hiligsmann M, Wyers CE, Mayer S, Evers SM, Ruwaard D. A systematic review of economic evaluations of screening programmes for cardiometabolic diseases. *Eur J Public Health* 2017 Aug 1;27(4):621-631.
27. Templeton L, Deehan A, Taylor C, Drummond C, Strang J. Surveying general practitioners: does a low response rate matter? *Br J Gen Pract* 1997 Feb;47(415):91-94.

Supplementary files

Supplementary file 1. Methods invitation of GPs per country

The Czech Republic

We contacted 250 GPs from the database of the Institute of General Practice, First Faculty of Medicine, Charles University and that of the Society of Young GPs. The sample was selected randomly, but this group includes the more cooperative and engaged individuals in general practice. The sample included GPs from all regions of the Czech Republic. Two reminders were sent. No remuneration was given for completing the questionnaire. Ethical approval was given by the Ethics Committee of the General Hospital and by the First Faculty of Medicine, Charles University in Prague.

Denmark

In Denmark, researchers do not have direct access to official GP mailing lists. Thus, in order to recruit GPs for study purposes, researchers must go through the Danish Medical Association (DMA; Praktiserende Lægers Organisation, PLO) - the overarching GP union in Denmark. Accordingly, we approached the DMA and asked them to send out invitations to Danish GPs. Initially, the DMA invited a random sample of 250 GPs, but later extended this to an additional 750 GPs. Thus a total of 1,000 GPs were ultimately invited to take part. This generated a response from 122 GPs. A remuneration of 500 DKK (€67) was given to any GPs who completed the questionnaire. The ethical review board declared that, under Danish law, this study did not require ethical approval.

Greece

In Greece, GPs were recruited from three different regions. These were the 5th Regional Health Authority of Sterea Ellada and Thessaly; the 6th Regional Health Authority Peloponnese, Ionian Islands and Western Greece; and the 7th Health Region of Crete. The above regions were representative of urban and rural areas, affluent areas, low-income areas and remote areas.

The aim was to recruit a minimum of 100 GPs from a list of 250 invited participants.

No national electronic records/databases of Greek GPs were available. We used two lists. The first was the registry of the National Organization of Health Care Services of Greece (EOPYY), which contained the details of 101 GPs. The second was a list of Greek General Practitioners, held by the Clinic of Social and Family Medicine. In total, 300 GPs were invited. This generated a response

from 116 GPs. A remuneration of €30 was paid to any GP who completed the questionnaire. This study was granted approval by the Bioethics Committee of the 7th Health Region of Crete on the 5th of August 2016 (Protocol Number: 11138-05/08/2016).

The Netherlands

The aim was to achieve a minimum response of 100 GPs per country. In the Netherlands, GPs' response rates to questionnaires are generally low, often around 20%. Accordingly, we decided to approach a total of 500 GPs. This sample was randomly drawn from 'Nivel beroepenregistraties' (the professional register of the Netherlands Institute for Health Services Research). The sample was representative of Dutch GPs in terms of gender (male, female), age (<30, 30-39, 40-49, 50-59, ≥60), practice location (rural, urban) and region (north, east, south, west). A printed invitation was distributed to these GPs. It contained details of a link to the questionnaire, plus an individual username and password. Two reminders were sent. When fewer than 100 GPs responded, we approached an additional 700 GPs, increasing the number of GPs invited to 1200. This sample was also representative of Dutch GPs, in terms of the criteria listed above. This generated a response from 112 GPs. A remuneration of €25 was sent to every GP who completed the entire questionnaire. The medical ethical committee of the UMC Utrecht was consulted. It concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act (WMO). They provided a declaration of non-WMO research (file number: 16-697/C).

Sweden

The invitations sent to GPs in Sweden were based on several different email lists. Key individuals in various county councils, located in rural and urban areas of Sweden, were also invited to invite GPs from their own mailing lists. In total, more than 500 GPs were invited by email. At least one reminder was sent to each GP. In addition, all of the GPs were asked to ask their colleagues to respond as well. Reminders were also sent to any GPs who responded, asking them to distribute the questionnaire. The Swedish association of GPs also posted an invitation to complete the questionnaire on their homepage (<http://www.sfam.se/artiklar/enkatundersokning>), asking doctors to participate. They also invited doctors to participate on their Facebook page, as did another closed Facebook group for GPs. Finally, Allmänmedicin (a professional journal for GPs, with over

3,000 subscribers) published an article in their December 2016 issue, inviting readers to complete the questionnaire. This generated responses from 92 GPs. No remuneration was given to those who responded. Ethical approval was given by the ethical review board in Stockholm.

Supplementary file 2. Definitions used in article

Selective prevention of cardiometabolic diseases (CMD) / selective CMD prevention: The identification of (screening for) persons with a high risk on developing CMD followed by interventions to lower their risk, in presently asymptomatic persons without established CMD.

Systematic selective prevention of CMD: Systematically inviting persons to screen for high risk of CMD, using a practice based protocol and the availability of disease management programmes for intervention.

Health check: Recruiting persons for a risk assessment, which can be seen as the first step / invitation step in selective prevention.

Active approach: Inviting persons actively for risk assessment for CMD, for example by telephone or letter.

Opportunistic approach: Inviting persons for risk assessment for CMD when the person already visits the practice for any reason.

Supplementary file 3. Method used to translate the questionnaire

The questionnaire was translated using the following procedure. The original English version was first translated into each national language by a native speaker. The translations were subsequently translated back into English by different individuals with a thorough knowledge of that language, but who had no knowledge of the original English version. The original questionnaires were compared to the translated versions. If any discrepancies were found, these were discussed with the SPIM-EU project partner in the respective country and adapted, if necessary.

Supplementary file 4. Characteristics of those GPs who completed the questionnaire and national characteristics of GPs from the respective countries

	CZ		DK		GR ^a		NL		SW	
	Q	C	Q	C	Q	C	Q	C	Q	C
Gender (% male)	36	38	54	50	48	51	45	48	40	53
Age (%)	47	18	4	6	43	Un-	33	23	27	9
<40	22	21	30	34	42	known	31	31	34	25
40-49	31	61	66	60	16		36	46	39	68
>50										

a: Information about 7th health region Greece (Crete)

CZ, the Czech Republic; DK, Denmark; GR, Greece; NL, the Netherlands; SW, Sweden; Q, questionnaire respondents; C, GPs typical of country

Supplementary file 5. Characteristics of healthcare

	the Czech Republic	Denmark	Greece	the Netherlands	Sweden
Primary care strength ¹	Medium	Strong	Weak	Strong	Medium
Gatekeeper ¹	No ^a	Yes	No	Yes	No
Health policy Level	State, regions ²	State, region and local (municipality) ³	National health system, region ⁴	State, municipality ⁵	State, country councils and regions ⁶
Funding of care in general	Statutory health insurance ²	Tax-funded ³	Public and private resources ⁴	Health insurance companies with managed competition ⁵	Tax-funded ⁶
College of GPs	Czech Society of General Practice ⁷	Danish Selskab for Almen Medicin (DSAM) ⁸	Greek College of General Practitioners ⁹	Dutch College of General Practitioners (NHG) ¹⁰	Swedish College of General Practice (SFAM) ¹¹
Current form of selective CMD prevention programme ^b	Yes	No	No	Partly, national guideline available	Yes, in one county

a People in the Czech Republic often visit their GP first before seeing a specialist

b A short description of the programme, if available, can be found below

Selective CMD prevention programmes

The Czech Republic

A nationwide selective prevention programme has already been implemented. This includes a biannual invitation, to anyone aged 18 and above, to systematically check their CMD risk.¹² Health insurance funds pay GPs a 'fee-for-service' to provide these health checks, so they are free of charge to patients.

The Netherlands

The Dutch College of General Practitioners (NHG) has developed a national guideline for a phased, selective CMD prevention programme. This 'prevention consultation cardiometabolic risk module'¹³ is a phased programme involving an initial risk assessment for anyone aged 45-70 with no known risk factor for CMD. Assessment is by means of a questionnaire (via internet, for example). Any at-risk individuals identified by this means are invited to visit their GP's practice for further, more extensive risk assessment and tailored interventions, if necessary. However, no reimbursement is yet available for the first step, and there is some debate about who is responsible for this risk assessment.¹⁴

Sweden

The Västerbotten intervention programme has been integrated into primary care in one county since 1985. When people reach the ages of 40, 50 and 60, they are invited to participate in a systematic risk factor screening. They are also provided with individual counselling regarding healthy lifestyle habits. The programme is funded by regional taxes. Primary care centres are paid 650 SEK (€66) for each completed health survey within the programme.¹⁵

Supplementary references

1. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.
2. Alexa J, Recka L, Votápková J, van Ginneken E, Spranger A, Wittenbecher F. Czech Republic, health system review. 2015; Available at: http://www.euro.who.int/__data/assets/pdf_file/0005/280706/Czech-HiT.pdf?ua=1. Accessed 08/16, 2017.
3. Olejaz M, Nielsen AJ, Rudkjøbing A, Birk HO, Krasnik A, Hernández-Quevedo C. Denmark, health system review. 2012; Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/160519/e96442.pdf?ua=1. Accessed 08/16, 2017.
4. Economou C. Greece, health system review. 2010; Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/130729/e94660.pdf?ua=1. Accessed 08/16, 2017.
5. Kroneman M, Boerma W, van den Berg M, Groenewegen P, de Jong J, van Ginneken E. Netherlands, health system review. 2016; Available at: http://www.euro.who.int/__data/assets/pdf_file/0016/314404/HIT_Netherlands.pdf?ua=1. Accessed 08/16, 2017.
6. Anell A, Glenngard AH, Merkur S. Sweden, health system review. 2012; Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/164096/e96455.pdf?ua=1. Accessed 08/16, 2017.
7. SVL. Společnost všeobecného lékařství (Czech society of General Practice). Available at: <http://www.svl.cz/en/>. Accessed 08/16, 2017.
8. DSAM. Dansk Selskab for Almen Medicin (Danish College of General Practitioners). Available at: <http://www.dsam.dk/>. Accessed 08/16, 2017.
9. E.KO.ΓEN.IA. ΕΛΛΗΝΙΚΟ ΚΟΛΛΕΓΙΟ ΓΕΝΙΚΩΝ ΙΑΤΡΩΝ (Greek college of General Practitioners). Available at: <http://www.collegegp.gr/>. Accessed 08/16, 2017.
10. NHG. Nederlands Huisartsen Genootschap (Dutch College of General Practitioners). Available at: <https://www.nhg.org/dutch-college-general-practitioners>. Accessed 08/16, 2017.
11. SFAM. Svensk förening för allmänmedicin (The Swedish College of General Practice). 2016; Available at: <http://www.sfam.se/foreningen/s/in-english-1>. Accessed 08/16, 2017.
12. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.
13. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
14. de Wit N, Hollander M, Schellevis F. Preventie hart- en vaatziekten is los zand. 2016; Available at: <https://www.medischcontact.nl/nieuws/laatste-nieuws/artikel/preventie-hart-en-vaatziekten-is-los-zand.htm>. Accessed 08/16, 2017.
15. Norberg M, Wall S, Boman K, Weinehall L. The Vasterbotten Intervention Programme: background, design and implications. *Glob Health Action* 2010 Mar 22;3:10.3402/gha.v3i0.4643.



Chapter 4

Active approach to identify individuals at high risk for cardiometabolic diseases in five European countries: no association with general practitioners' characteristics

Anne-Karien M. de Waard, Monika Hollander, Joke C. Korevaar, Mark M. J. Nielen, Bohumil Seifert, Christos Lionis, Axel C. Carlsson, Jens Søndergaard, Niek J. de Wit and François G. Schellevis, on behalf of the SPIMEU project group*

* SPIMEU project group also consists of: Agapi Angelaki, N. Král, Anders L. Sønderlund and P. Wändell

Short report, submitted



Abstract

Background: To identify individuals at high risk of cardiometabolic diseases (CMD), general practitioners (GPs) could pro-actively invite their patients for CMD risk assessment, and start interventions in high-risk patients to decrease their CMD risk if necessary.

Objective: To report characteristics and attitudes associated with pro-active behaviour of GPs in relation to the identification of individuals at high risk of CMD.

Materials and methods: We performed an online questionnaire comprising GPs from five European countries (the Czech Republic, Denmark, Greece, the Netherlands and Sweden) participating in the SPIMEU project. We used descriptive statistics and (multilevel) logistic models for the complete case analyses.

Results: On average 48% of the GPs indicated that they actively approached patients for CMD risk assessment: Denmark 27%, the Netherlands 40%, Sweden 42%, Greece 52%, and the Czech Republic 70%. Country was the only factor statistically significantly associated with an active approach. Most GPs prefer to do selective prevention of CMD in general practice.

Conclusion: We conclude that more the country specific health care context than GPs' characteristics determine their involvement in actively approaching patients for a CMD risk assessment. To facilitate implementation of selective prevention of CMD, we recommend to first focus on embedding the selective prevention in the health care system as a whole, and not focus on the individual GPs.

Introduction

Cardiometabolic diseases (CMDs), including cardiovascular disease (CVD), diabetes mellitus and chronic renal failure, are the number-one cause of death in the world.¹ Selective prevention of CMDs, entailing identification of presently asymptomatic individuals at high risk followed by interventions to lower their risk, could contribute to reducing the burden of CMD in the population.² To identify these individuals at high risk, general practitioners (GPs) could pro-actively invite their patients for CMD risk assessment.

A previous study showed that general practices implementing selective CMD-prevention are more often organised as a group practice.³ More information on which GPs are more or less likely to be involved in pro-actively inviting their patients for CMD risk assessment could help to guide the implementation of selective CMD prevention programmes.

We studied the association between GPs' characteristics and pro-active behaviour of GPs, as well as their opinion on how to organise these activities. This could provide a starting point for the development and further implementation of selective prevention of CMD in primary care across Europe.

Materials and methods

We developed an online questionnaire, based on a previous study.⁴ The questionnaire was distributed among GPs from five European countries participating in the SPIMEU project (the Czech Republic, Denmark, Greece, the Netherlands and Sweden), between September 2016 and January 2017. Detailed description of methods for the invitation of GPs and translation of the questionnaire can be found in Supplementary file 1 and 2. In all five countries the appropriate ethical procedures were followed.

Statistical analysis

We performed a complete case analysis with a positive answer to the statement: *"in my practice we actively approach patients for selective prevention of CMD"* as outcome. Actively approaching patients was defined as *"inviting patients for a CMD risk assessment for example by e-mail, letter or telephone"*. In univariable analyses we assessed the association with nine GP characteristics and scores on eight statements on GPs' attitudes towards prevention and lifestyle. The eight statements were selected using a categorical principal component analysis. We included determinants with a p-value above 0.2 in a multivariable logistic model

including country as a determinant and a multilevel logistic model with country as level. Furthermore, we used descriptive statistics to describe the GPs' opinion about the organisation of selective prevention of CMD.

Results

The total response rate was 16%^a (range 9-48%) and 496 completed questionnaires were included in the analyses. More respondents were female (56%) and 37% was aged 50 years or older. On average 48% of the GPs indicated to approach patients actively for a CMD risk assessment: Denmark 27%, the Netherlands 40%, Sweden 42%, Greece 52%, and the Czech Republic 70%. In the multivariable analysis only 'country' was significantly associated with an active approach by GPs. In the multilevel analysis including country as level, no determinants were significantly associated with an active approach (Table 1). In the univariable analysis stratified by country no determinants were consistently positively or negatively associated with an active approach.

According to the majority of the GPs, both men and women should be included in a selective prevention programme. The preferred median age group ranged from 40 to 70 years old. On average 92% of the GPs preferred implementation in general practice, ranging from 81% in Denmark to 98% in the Czech Republic. In the Netherlands and the Czech Republic, the majority of GPs (71%) preferred a leading role for the health insurance company whereas in Denmark, Greece and Sweden GPs preferred governments to be responsible for financing selective prevention programmes for CMD. In total 63 out of 496 GPs (13%) did not want to implement selective prevention programmes in their practice at all, ranging from 2% in the Czech Republic to 25% in Denmark.

Discussion

In five EU countries, GPs' characteristics and their attitude seems to be not related with a pro-active approach for CMD risk assessment. Most GPs think that selective CMD prevention should be implemented through general practice. Intended financial responsibility for implementation of selective CMD prevention differs between countries.

This conclusion is not in line with earlier studies that reported some GPs characteristics to be associated with CMD prevention practice: GPs who smoke felt less effective in helping patients to reduce smoking than GPs who did not

a. Response rate was: 9%, 10%, 36% and 48% for the Netherlands, Denmark, Greece and the Czech Republic. For Sweden it was not possible to retrieve how many GPs were approached, so we were not able to calculate a response rate

smoke⁵ and cardiovascular risk was less well assessed in female patients who are seen by male GPs.⁶ However, these studies focused on lifestyle interventions conducted by GPs, which represents the second step in selective prevention. This study focused on the first step, namely the active approach for a risk assessment to identify individuals at high risk.

Given the differences between the countries, country specific factors, for example availability of a national programme, funding and task description for GPs are apparently more important for actively approaching patients for a CMD risk assessment than individual GPs' characteristics. For example, the Czech Republic already has a nationwide selective prevention programme, to systematically check people's CMD risk,⁷ and GPs most often invited people for a CMD risk assessment in this country.

Strengths and weaknesses

To our knowledge, this study seems to be the first study that has examined the factors associated with actively approaching patients for a risk assessment. The survey may have been subject to non-response bias. The response rates differed from one country to another, and GPs with a more positive attitude towards prevention may have been overrepresented. The sample size in this study was fairly small, especially when countries were studied separately, which might have resulted in a lack of power to reach statistical significance. However, we did not find determinants that were consistently positively or negatively associated in each country, which confirms the finding that country specific factors are important for the activities of GPs.

We conclude that more the country specific health care context than GPs' characteristics determine their involvement in actively approaching patients for a CMD risk assessment. To facilitate implementation of selective prevention of CMD, we recommend to first focus on embedding the selective prevention in the health care system as a whole, and not focus on the individual GPs.

Key message: To facilitate implementation of selective prevention of CMD, we recommend to first focus on embedding the selective prevention in the health care system as a whole, and not focus on the individual GPs.

Conflict of interest: None declared. *Ethical approval:* In all five countries the appropriate ethical procedures were followed.

Table 1. General practitioner and practice characteristics associated with an active approach to invite individuals for a health check

N= 496		Univariable			Multivariable		
Characteristics GPs		OR	95% CI	p-value	OR	95% CI	p-value
Sex	Female	0.99	0.69-1.41	0.953			
Age	<40	1.00	0.48-1.16	0.194	1.00	0.57-1.53	0.775
	40-49	0.75	0.56-1.32	0.492	0.93	0.80-2.26	0.271
	≥ 50	0.86			1.34		
BMI	<25	1.00	0.69-1.53	0.893			
	25-30	1.03	0.66-2.80	0.402			
	>30	1.36					
Smoking	Yes	1.76	0.90-3.47	0.100	1.63	0.73-3.61	0.230
CMD	Yes	1.50	0.85-2.67	0.166	1.19	0.62-2.29	0.612
Practice characteristics							
Years working as GP		1.01		0.281			
Employment	Salaried or combination	1.00	0.59-1.19	0.328			
	Self employed	0.84					
Location practice	Big (inner) city, suburbs	1.00	0.52-1.05	0.092	1.00	0.54-1.25	0.36
	Town, mixed urban-rural, rural	0.74			0.82		
Type practice	Single-handed	1.00	0.44-1.05	0.079	1.00	0.72-2.01	0.475
	Dual/group practice	0.68	0.38-1.04	0.071	1.21	0.41-1.50	0.458
	PC ^a center with more disciplines	0.63			0.78		
	Outpatient clinic, hospital	0.78	0.37-1.65	0.518	0.55	0.24-1.23	0.143
Country	Czech Republic	1.00	0.09-0.29	<0.001	1.00	0.08-0.43	<0.001
	Denmark	0.16	0.28-0.82	0.008	0.19	0.29-1.07	0.078
	Greece	0.48	0.17-0.58	<0.001	0.55	0.20-1.08	0.074
	Sweden	0.31	0.17-0.51	<0.001	0.46	0.17-0.71	0.004
	The Netherlands	0.29			0.34		

Statements							
Selective prevention of CMD is useful	I agree	1.00	0.07-0.52	0.001	1.00	0.12-1.34	0.136
	I disagree	0.20	0.16-0.57	<0.001	0.40	0.26-1.22	0.146
	I don't know	0.30			0.56		
Selective prevention of CMD is a waste of money	I agree	1.00	1.57-10.19	0.004	1.00	0.49-5.16	0.441
	I disagree	4.00	0.45-3.42	0.68	1.59	0.24-2.85	0.759
	I don't know	1.24			0.82		
People with an unhealthy lifestyle have to pay more for health care	I agree	Ref	0.31-0.70	<0.001	1.00	0.49-1.45	0.534
	I disagree	0.47	0.56-1.55	0.78	0.84	0.61-1.98	0.749
	I don't know	0.93			1.10		
Health insurance companies should reward patients with a healthy lifestyle. For example with a discount on the insurance costs	I agree	1.00	0.25-0.62	<0.001	1.00	0.52-1.68	0.824
	I disagree	0.39	0.48-1.26	0.31	0.94	0.72-2.24	0.405
	I don't know	0.78			1.27		
Promoting a healthy lifestyle is the task of the government	I agree	1.00	0.69-2.30	0.456	1.00		
	I disagree	1.26	0.41-1.58	0.529	1.26		
	I don't know	0.81			0.81		
In the healthcare system of my country it is very difficult to refer patients with an increased risk of CMD to other disciplines (for example dietician or physiotherapists) for additional preventive activities	I agree	1.00	0.75-1.62	0.64	1.00		
	I disagree	1.10	0.38-2.85	0.93	1.10		
	I don't know	1.04			1.04		
There are enough options to delegate tasks for selective prevention of CMD to other professionals in my practice	I agree	1.00	1.03-2.21	0.036	1.00	0.54-1.46	0.637
	I disagree	1.51	0.58-2.17	0.732	1.51	0.40-1.85	0.702
	I don't know	1.12			0.86		
The government should constrain people's freedom considering lifestyle related factors. For example non-smoking areas, restrict purchase of tobacco etc.	I agree	1.00	0.67-1.50	0.983	1.00		
	I disagree	1.01	0.59-2.37	0.639	1.01		
	I don't know	1.18			1.18		

CMD, Cardiometabolic disease; GPs, General Practitioners; OR, Odds Ratio; 95% CI, 95% confidence interval

References

1. WHO. Cardiovascular diseases. 2016; Available at: <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed 06/15, 2018.
2. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.
3. Stol DM, Hollander M, Nielen MMJ, Badenbroek IF, Schellevis FG, de Wit NJ. Implementation of selective prevention for cardiometabolic diseases; are Dutch general practices adequately prepared? *Scand J Prim Health Care* 2018 Mar;36(1):20-27.
4. Nielen MM, Assendelft WJ, Drenthen AJ, van den Hombergh P, van Dis I, Schellevis FG. Primary prevention of cardio-metabolic diseases in general practice: a Dutch survey of attitudes and working methods of general practitioners. *Eur J Gen Pract* 2010 Sep;16(3):139-142.
5. Brotons C, Björkelund C, Bulc M, Ciurana R, Godycki-Cwirko M, Jurgova E, et al. Prevention and health promotion in clinical practice: the views of general practitioners in Europe. *Preventive Medicine* 2005 May 2005;40(5):595-601.
6. Delpech R, Ringa V, Falcoff H, Rigal L. Primary prevention of cardiovascular disease: More patient gender-based differences in risk evaluation among male general practitioners. *Eur J Prev Cardiol* 2016 Nov;23(17):1831-1838.
7. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.

Supplementary files

Supplementary file 1. Methods invitation of GPs per country

The Czech Republic

We contacted 250 GPs from the database of the Institute of General Practice, First Faculty of Medicine, Charles University and that of the Society of Young GPs. The sample was selected randomly, but this group includes the more cooperative and engaged individuals in general practice. The sample included GPs from all regions of the Czech Republic. Two reminders were sent. No remuneration was given for completing the questionnaire. Ethical approval was given by the Ethics Committee of the General Hospital and by the First Faculty of Medicine, Charles University in Prague.

Denmark

In Denmark, researchers do not have direct access to official GP mailing lists. Thus, in order to recruit GPs for study purposes, researchers must go through the Danish Medical Association (DMA; Praktiserende Lægers Organisation, PLO) - the overarching GP union in Denmark. Accordingly, we approached the DMA and asked them to send out invitations to Danish GPs. Initially, the DMA invited a random sample of 250 GPs, but later extended this to an additional 750 GPs. Thus a total of 1,000 GPs were ultimately invited to take part. This generated a response from 122 GPs. A remuneration of 500 DKK (€67) was given to any GPs who completed the questionnaire. The ethical review board declared that, under Danish law, this study did not require ethical approval.

Greece

In Greece, GPs were recruited from three different regions. These were the 5th Regional Health Authority of Sterea Ellada and Thessaly; the 6th Regional Health Authority Peloponnese, Ionian Islands and Western Greece; and the 7th Health Region of Crete. The above regions were representative of urban and rural areas, affluent areas, low-income areas and remote areas.

The aim was to recruit a minimum of 100 GPs from a list of 250 invited participants. No national electronic records/databases of Greek GPs were available. We used two lists. The first was the registry of the National Organization of Health Care Services of Greece (EOPYY), which contained the details of 101 GPs. The second was a list of Greek General Practitioners, held by the Clinic of Social and Family Medicine. In total, 300 GPs were invited. This generated

a response from 116 GPs. A remuneration of €30 was paid to any GP who completed the questionnaire. This study was granted approval by the Bioethics Committee of the 7th Health Region of Crete on the 5th of August 2016 (Protocol Number: 11138-05/08/2016).

The Netherlands

The aim was to achieve a minimum response of 100 GPs per country. In the Netherlands, GPs' response rates to questionnaires are generally low, often around 20%. Accordingly, we decided to approach a total of 500 GPs. This sample was randomly drawn from '*Nivel beroepenregistraties*' (the professional register of the Netherlands Institute for Health Services Research). The sample was representative of Dutch GPs in terms of gender (male, female), age (<30, 30-39, 40-49, 50-59, ≥60), practice location (rural, urban) and region (north, east, south, west). A printed invitation was distributed to these GPs. It contained details of a link to the questionnaire, plus an individual username and password. Two reminders were sent. When fewer than 100 GPs responded, we approached an additional 700 GPs, increasing the number of GPs invited to 1200. This sample was also representative of Dutch GPs, in terms of the criteria listed above. This generated a response from 112 GPs. A remuneration of €25 was sent to every GP who completed the entire questionnaire. The medical ethical committee of the UMC Utrecht was consulted. It concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act (WMO). They provided a declaration of non-WMO research (file number: 16-697/C).

Sweden

The invitations sent to GPs in Sweden were based on several different email lists. Key individuals in various county councils, located in rural and urban areas of Sweden, were also invited to invite GPs from their own mailing lists. In total, more than 500 GPs were invited by email. At least one reminder was sent to each GP. In addition, all of the GPs were asked to ask their colleagues to respond as well. Reminders were also sent to any GPs who responded, asking them to distribute the questionnaire. The Swedish association of GPs also posted an invitation to complete the questionnaire on their homepage (<http://www.sfam.se/artiklar/enkatundersokning>), asking doctors to participate. They also invited doctors to participate on their Facebook page, as did another closed Facebook group for GPs. Finally, *Allmänmedicin* (a professional journal for GPs, with over

3,000 subscribers) published an article in their December 2016 issue, inviting readers to complete the questionnaire. This generated responses from 92 GPs. No remuneration was given to those who responded. Ethical approval was given by the ethical review board in Stockholm.

Supplementary file 2. Method used to translate the questionnaire

The questionnaire was translated using the following procedure. The original English version was first translated into each national language by a native speaker. The translations were subsequently translated back into English by different individuals with a thorough knowledge of that language, but who had no knowledge of the original English version. The original questionnaires were compared to the translated versions. If any discrepancies were found, these were discussed with the SPIMEU project partner in the respective country and adapted, if necessary.





Chapter 5

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

Per E. Wändell, Anne-Karien M. de Waard, Martin J. Holzmann, Carl Gornitzki, Christos Lionis, Niek J. de Wit, Jens Søndergaard, Anders L. Sønderlund, Norbert Král, Bohumil Seifert, Joke C. Korevaar, François G. Schellevis, Axel C. Carlsson.

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.

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 preventable⁴ 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 activity⁸ and diet⁹ 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 sub-groups of the population are at higher risk of CMD, including those of low socio-economic 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 sub-groups 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 in Supplementary file 1. 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 healthcare 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 of 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.

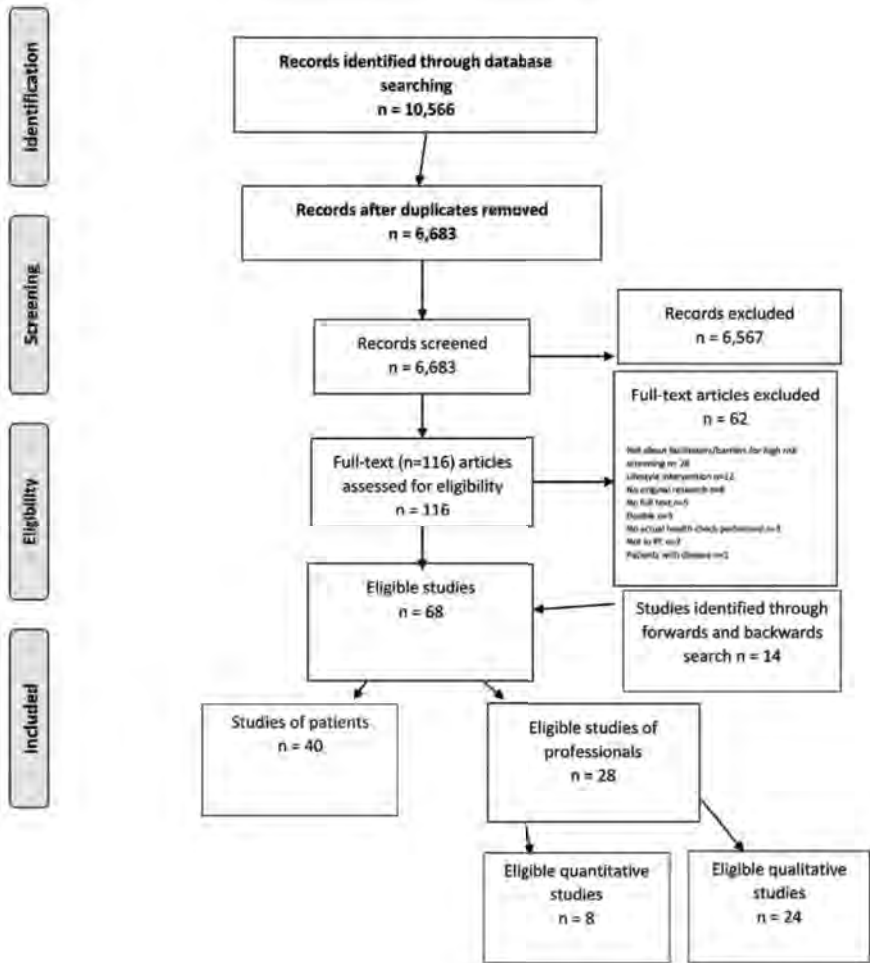
To systematize the information, we categorized the articles by the type of barrier/facilitator they focused on, as others have previously described.²⁹⁻³¹ In short, we organized the barriers and facilitating factors from the retained articles into *structural* (related to local, regional and national 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 Singapore⁴¹) 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.

Figure 1. PRISMA 2009 flow diagram. From Moher et al.⁶³



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),^{25,32,35,37,39,42,43,47,51-54} insufficient reimbursement (10 studies),^{29,30,33,34,38,41,46,47,53,54} or to problems with guidelines (6 studies).^{30,37,40,41,43,53,54} Other structural barriers reported were related 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),^{41,51,52} 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,²⁵ 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),^{25,37,41,42,46} 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 system³⁷ 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} and that motivation of patients is effective (4 studies).^{25,50,52,53} Other facilitating factors related to sufficient knowledge⁵³ 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 Other barriers 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 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 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 acceptability⁵⁰ and feasibility.³⁴

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

Author, Publication Year, Country	Type of study	Health care groups	Responders, n=	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	156	78%			Phone survey
Step toe, 1999, UK	Quantitative	GPs, PNs	107+58	100%			Postal survey
Williams, 2004, UK (Wales)	Qualitative	GPs, PNs	21+22				Focus groups
Wright, 2006, UK	Qualitative	PHC staff: GPs, PNs; CMHT staff: 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%			Focus groups
Voogdt-Pruis, 2011, The Netherlands	Qualitative	GPs, PNs	25+6				Interviews

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	7+1	39%	Witness seminar; interview
Baker, 2015 UK	Mixed	GPs, PNs, HCAs, PMs, administrator	2+6+2+14+1	40-74 years	Interviews
Barfoed, 2015, Denmark	Qualitative	GPs	10		Interviews
Diehl, 2015, Germany	Quantitative	GPs	4074	33.9%	Postal survey
Gavarkovs, 2015, Canada	Qualitative	CDPM program delivery staff	10		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	GPs, 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 cardio-metabolic disease in primary care

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* (health education is dull and boring; causes problems for the patients) Inappropriate skills*	Positive attitudes to prevention* Training in health promotion* Higher number of practice nurses* GP spends more hours on research and training* Positive attitudes by female GPs* Assistance* (from facilitator, or authorities) IT support*	
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*, regular team work meetings*, more practice assistance (ns)) 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*, CVD prevention is an important task in primary care (78%)) Self-efficacy (significant to registration of follow-up appointments*; 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 in stop smoking (82% and 65%), can contribute to a healthier way of living (45%))	

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)	Identify prevention strategies: 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	Focus on knowledge of different risk factors
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 counsel for lifestyle factors, to 99.3% in screening)
Steptoe, 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) Doubt that you can offer patients a great deal in the way of lifestyle counselling (GP 75.0%, PN 50.0% neutral) Doubt that lifestyle counselling is very effective (GP 70.5%, PN 42.9% neutral)	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%) 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)	

Table 2. Continued

Author, Publication Year, Country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
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	Importance of prevention High risk patients should be seen anyway	Concerns type 2 diabetes only
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	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	Urban practices* (OR 0.66; 95% CI 0.65-0.68) Density of GPs* (OR 0.76; 95% CI 0.63-0.92)	Daily work load* (OR 1.03; 95% CI 1.01-1.05) Elderly patient list (> 65 y)* (OR 1.04; 95% CI 1.02-1.07) High health care consumption* (OR 4.29; 95% CI 3.62-5.00)	Register study of preventive services

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 behavior, proved to be more difficult	A useful opportunity to assess and manage risk factors A belief that preventive care was part of their role and responsibility Health check feasible	Short follow-up time
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 behavior 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
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

Table 2. Continued

Author, Publication Year, Country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
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 among 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 life style 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	

Huy, 2012, Germany	# Quantitative	<p>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%)</p>	<p>I can offer my patients a wide range of lifestyle advice (49.1%)* (OR 3.55; 95% CI 1.82-6.93) Risk factor questionnaires in the waiting room (61.5%)* (OR 2.26; 95% CI 1.06-4.85) Female gender of GP* (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%)</p>	Response rate 13%
Sondergaard, 2012, Denmark	Qualitative	<p>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</p>	Preventive health checks beneficial for the patients	
Ferrante, 2013, Argentina	Qualitative	<p>Lack of awareness of guidelines Lack of knowledge about preventing cardiovascular disease Communication problems within health teams Lack of motivation Organizational problems Low quality of recording</p>	Intervention tailored to target identified barriers	Focused on barriers for designing an intervention

Table 2. Continued

Author, Publication Year, Country	Type of study	Barriers	Facilitators	Bias and potential quality short-comings
George, 2013, Singapore	Mixed	<p>Lack of direct access /co-management with renal physician</p> <p>Lack of interest</p> <p>Nature of my practice</p> <p>Lack of confidence and faith</p> <p>Lack of sufficient support & experience</p> <p>Lack of time to keep up-to-date.</p> <p>Lack of medicine for CK</p> <p>Lack of IT support.</p> <p>Too much paperwork.</p> <p>Lack of patient education.</p> <p>Poor patient compliance.</p> <p>Lack of family / social support management.</p> <p>Lack of time to explain to the patient.</p>	<p>Access to/co-operation with renal specialist</p> <p>Adequate remuneration</p> <p>Technological assistance, IT</p> <p>Patient education, also to trust the GPs</p> <p>§ Quantitative results:</p> <p>Less cost for patient (2.5)</p> <p>Access to patient's information (2.8)</p> <p>Access to updates and guidelines (3.0)</p> <p>More support services (3.2)</p> <p>Less time consumed (3.3)</p>	<p>Concerns screening for chronic kidney disease</p> <p>Response rate of quantitative survey 25%</p>
Godefrooij, 2014, The Netherlands	Qualitative	<p>Lack of experience in the design and implementation of a structured, large-scale prevention programme, suboptimal instruction of involved staff</p> <p>No clear policy about how to follow-up patients with "medium risk", not exceeding the risk to be referred to their GP</p>	<p>Importance of primary prevention, (high yield of health check, helped GPs to identify their high-risk population in a structured manner)</p> <p>Collaboration, i.e. "delegation of care", health checks were delivered by medical receptionists and practice nurses, and GPs involved for high-risk patients</p>	<p>Study included both patients and health-care staff</p>
Vos, 2014, The Netherlands	Qualitative	<p>Organizational context: insufficient reimbursement</p> <p>Professional context: lack of evidence and guidelines</p> <p>Social context: no focus on prevention</p>	<p>Organizational context: Sufficient logistic and practical support and finances</p> <p>Responsibility to offer prevention, equity</p> <p>Professional context: Evidence and guidelines</p> <p>Social context: prevention focused on</p>	

Baker, 2015 UK	Mixed	<p>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 Caution concerning the programmes overall effectiveness</p>	<p>Opportunistic approaches 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</p>	Small sample size, no response rate given
Barfoed, 2015, Denmark	Qualitative	<p>Guidelines inhibit the ability to practice independently as a GP Risk communication tools are insufficient Resigned approach to manage patient compliance</p>	<p>Guidelines good and applicable Use of different communication tools depending on the patient context Confrontational approach to manage low patient compliance</p>	
Diehl, 2015, Germany	Quantitative	<p>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%)</p>	<p>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%)</p>	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	Hiring qualified male instructors Engaging spouses	Concerns recruiting male participants in a rural district
Ismail, 2015, UK	Qualitative	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 lifestyle changes 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	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	
Riley, 2015, UK	Qualitative	Concerns about the skill set of some staff to competently communicate risk and lifestyle information Lack of referral services	Sufficient training to equip health care staff with appropriate skills and knowledge to deliver the service effectively	Study included both patients and staff
Krska, 2016, UK	Qualitative	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	IT support Effective software Health checks beneficial for patients	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.

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

b: Obstacles include great, medium or small barriers.

c: Obstacles 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 cardio-metabolic diseases in patients without established disease in primary care. Numbers of studies reporting a specific factor given.

Context	Barriers	Facilitators
Structural context:	<p>Lack of time, extra workload (18 studies)</p> <p>Lack of space in the building (3 studies)</p> <p>Insufficient reimbursement or community resources (10 studies)</p> <p>Guidelines: Lack of awareness of guidelines, lack of evidence and guidelines; too many guidelines in the area, or difficult to follow guidelines) (6 studies)</p> <p>Lack of available and accessible referral (5 studies)</p> <p>Lack of assistance and support from authorities (2 studies)</p> <p>Lack of material for patients (4 studies)</p> <p>Lack of effective and feasible counselling (12 studies)</p> <p>Problems related to follow-up (2 studies)</p>	<p>Availability of time (3 studies)^a</p> <p>Sufficient finances (2 studies)</p> <p>Access to good guidelines (2 studies)</p> <p>Ensuring adequate referral (3 studies)^a</p> <p>Ensuring adequate follow-up (2 studies)^a</p> <p>Assistance and support from authorities (4 studies)^a</p> <p>Identifying obstacles for prevention (3 studies)</p> <p>Providing information and educational materials (3 study)</p> <p>Counselling and interventions feasible and effective (10 studies)^a</p> <p>Information in media (1 study)</p> <p>Legislation for unhealthy habits (e.g. smoking) (1 study)</p>
Organizational context:	<p>Organizational problems in general (3 studies)</p> <p>Lack of strong leadership and consistent messages (1 study)</p> <p>Lack of IT support, software (5 studies)</p> <p>Lack of local support services, communication problems (4 studies)</p> <p>Insufficient connection with other preventive service providers (1 study)</p> <p>Lack of access to information on patients (5 studies)</p> <p>Low quality of recording (2 studies)</p> <p>Lack of suitable appointment times for employed patients (3 studies)</p> <p>Role of practices, no responsibility to offer prevention (6 studies)</p> <p>Roles of primary care staff (4 studies)</p>	<p>Structured organization of practice (4 studies)^a</p> <p>IT support (5 studies)^a</p> <p>Assistance and support within practice and teams (8 studies)^a</p> <p>Important role of practice nurses (4 studies)^a</p> <p>Cooperation with allied health staff or community resources (3 studies)</p> <p>Access to patient information or register (2 studies)^a</p> <p>Integrated electronic patient record system (1 study)</p> <p>Appointment system (2 studies)</p> <p>Intervention tailored to target identified barriers (2 study)</p> <p>Flexibility in counselling (5 study)^a</p> <p>Responsibility to offer and importance of prevention (10 studies)</p> <p>Useful opportunity of health checks and prevention (5 studies)</p>

Table 3. Continued

Context	Barriers	Facilitators
Professional context:	Lack of education/training/skills to competently communicate risk and lifestyle information (lack of counselling skills) (6 studies)* Lack of knowledge (5 studies) Lack of experience (3 studies)	Sufficient training and education (10 studies) ^a Effective in motivation 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.
a: Significant factors when statistical analyses were performed.

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 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 cardiometabolic 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 present 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.

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 Apr;62(2):113-118.
2. Laribi S, Aouba A, Resche-Rigon M, Johansen H, Eb M, Peacock FW, et al. Trends in death attributed to myocardial infarction, heart failure and pulmonary embolism in Europe and Canada over the last decade. *QJM* 2014 Oct;107(10):813-820.
3. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004 Sep 11-17;364(9438):937-952.
4. Perry IJ. Healthy diet and lifestyle clustering and glucose intolerance. *Proc Nutr Soc* 2002 Nov;61(4):543-551.
5. Persson LG, Lindstrom K, Lingfors H, Bengtsson C, Lissner L. Cardiovascular risk during early adult life. Risk markers among participants in "Live for Life" health promotion programme in Sweden. *J Epidemiol Community Health* 1998 Jul;52(7):425-432.
6. Persson L, Lingfors H, Nilsson M, Mölsted S. 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 Journal of Preventive Medicine* 2015;5(03):92.
7. Persson LG, Lingfors H, Nilsson M, Molstad S. 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 May 6;5(5):e006798-2014-006798.
8. Shaw KA, Gennat HC, O'Rourke P, Del Mar C. Exercise for overweight or obesity. *Cochrane database of systematic reviews* 2006(4):Art No. CD003817.
9. Rees K, Dyakova M, Wilson N, Ward K, Thorogood M, Brunner E. Dietary advice for reducing cardiovascular risk. *Cochrane Database Syst Rev* 2013 Dec 6;(12):CD002128. doi(12):CD002128.
10. Sanchez A, Bully P, Martinez C, Grandes G. Effectiveness of physical activity promotion interventions in primary care: A review of reviews. *Prev Med* 2015 Jul;76 Suppl:S56-67.
11. Strid C, Lingfors H, Fridlund B, Mårtensson J. Lifestyle changes in coronary heart disease—Effects of cardiac rehabilitation programs with focus on intensity, duration and content: A systematic review. *Open Journal of Nursing* 2012;2(4):420-430.
12. Mrazek PJ, Haggerty RJ, editors, Committee on Prevention of Mental Disorders. Institute of Medicine. Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research. Division of Biobehavioral Sciences and Mental Disorders. Washington, DC: National Academy Press; 1994.
13. Rosengren A, Hawken S, Ounpuu S, Sliwa K, Zubaid M, Almahmeed WA, 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 Sep 11-17;364(9438):953-962.

14. Carlsson AC, Starrin B, Gigante B, Leander K, Hellenius M, de Faire U. 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(1):17.
15. Wandell PE, Carlsson AC, Steiner KH. Prevalence of diabetes among immigrants in the Nordic countries. *Current diabetes reviews* 2010;6(2):126-133.
16. Wandell P, Ljunggren G, Wahlstrom L, Carlsson AC. Diabetes and psychiatric illness in the total population of Stockholm. *J Psychosom Res* 2014 Sep;77(3):169-173.
17. Glover G, Williams R, Heslop P, Oyinlola J, Grey J. Mortality in people with intellectual disabilities in England. *J Intellect Disabil Res* 2017 Jan;61(1):62-74.
18. Clark AM, DesMeules M, Luo W, Duncan AS, Wielgosz A. Socioeconomic status and cardiovascular disease: risks and implications for care. *Nat Rev Cardiol* 2009 Nov;6(11):712-722.
19. Marmot MG. Status syndrome: a challenge to medicine. *JAMA* 2006 Mar 15;295(11):1304-1307.
20. Rubio-Valera M, Pons-Vigues M, Martinez-Andres M, Moreno-Peral P, Berenguera A, Fernandez A. Barriers and facilitators for the implementation of primary prevention and health promotion activities in primary care: a synthesis through meta-ethnography. *PLoS One* 2014 Feb 28;9(2):e89554.
21. Carlsson AC, Wandell PE, Gigante B, Leander K, Hellenius ML, de Faire U. 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 Sep 30;168(2):946-952.
22. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal* 2009;26(2):91-108.
23. Godefrooij M, Spigt M, van der Minne W, Jurrissen G, Dinant GJ, Knottnerus A. Implementing cardiometabolic health checks in general practice: a qualitative process evaluation. *BMC Fam Pract* 2014 Jul 6;15:132-2296-15-132.
24. Ismail H, Atkin K. The NHS Health Check programme: insights from a qualitative study of patients. *Health Expect* 2016 Apr;19(2):345-355.
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 Oct 20;16:144-015-0365-z.
26. Naslund GK, Fredrikson M, Hellenius ML, de Faire U. Characteristics of participating and nonparticipating men in a randomized, controlled diet and exercise intervention trial. *Scand J Prim Health Care* 1994 Dec;12(4):249-254.
27. Koopmans B, Nielen MM, Schellevis FG, Korevaar JC. Non-participation in population-based disease prevention programs in general practice. *BMC Public Health* 2012 Oct 9;12:856-2458-12-856.

28. Pace R, Pluye P, Bartlett G, Macaulay AC, Salsberg J, Jagosh J, 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 Jan;49(1):47-53.
29. Makrides L, Veinot PL, Richard J, Allen MJ. Primary care physicians and coronary heart disease prevention: a practice model. *Patient Educ Couns* 1997 Nov;32(3):207-217.
30. Vos HMM, Adan IMA, Schellevis FG, Lagro-Janssen ALM. Prevention in primary care: Facilitators and barriers to transform prevention from a random coincidence to a systematic approach. *J Eval Clin Pract* 2014 /;20(3):208-215.
31. Pelletier-Fleury N, Le Vaillant M, Hebbrecht G, Boisnault P. Determinants of preventive services in general practice: A multilevel approach in cardiovascular domain and vaccination in France. *Health Policy* 2007;81(2-3):218-227.
32. Mann KV, Putnam RW. Barriers to prevention: physician perceptions of ideal versus actual practices in reducing cardiovascular risk. *Can Fam Physician* 1990 Apr;36:665-670.
33. Wright CA, Osborn DP, Nazareth I, King MB. Prevention of coronary heart disease in people with severe mental illnesses: a qualitative study of patient and professionals' preferences for care. *BMC Psychiatry* 2006 Apr 21;6:16-244X-6-16.
34. Amoroso C, Harris MF, Ampt A, Laws RA, McKenzie S, Williams AM, et al. The 45 year old health check - feasibility and impact on practices and patient behaviour. *Aust Fam Physician* 2009 May;38(5):358-362.
35. Ampt AJ, Amoroso C, Harris MF, McKenzie SH, Rose VK, Taggart JR. Attitudes, norms and controls influencing lifestyle risk factor management in general practice. *BMC Fam Pract* 2009 Aug 26;10:59-2296-10-59.
36. Wan Q, Harris MF, Zwar N, Vagholkar S, Campbell T. 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 Jun;16(3):580-584.
37. Voogdt-Pruis HR, Beusmans GH, Gorgels AP, van Ree JW. Experiences of doctors and nurses implementing nurse-delivered cardiovascular prevention in primary care: a qualitative study. *J Adv Nurs* 2011 Aug;67(8):1758-1766.
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 Mar 1;4(1):21-29.
39. Sondergaard A, Christensen B, Maindal HT. Diversity and ambivalence in general practitioners' attitudes towards preventive health checks - a qualitative study. *BMC Fam Pract* 2012 Jun 8;13:53-2296-13-53.
40. Ferrante D, Konfino J, Linetzky B, Tambussi A, Laspiur S. Barriers to prevention of cardiovascular disease in primary care settings in Argentina. *Rev Panam Salud Publica* 2013 Apr;33(4):259-266.

41. George PP, Oh CM, Loh PT, Heng BH, Lim FS. Right-siting chronic kidney disease care-a survey of general practitioners in Singapore. *Ann Acad Med Singapore* 2013 Dec;42(12):646-656.
42. Baker C, Loughren EA, Crone D, Kallfa N. Perceptions of health professionals involved in a NHS Health Check care pathway. *Practice Nursing* 2015;26(12):608-612.
43. Barfoed BL, Jarbol DE, Paulsen MS, Christensen PM, Halvorsen PA, Nielsen JB, et al. GPs' Perceptions of Cardiovascular Risk and Views on Patient Compliance: A Qualitative Interview Study. *Int J Family Med* 2015;2015:214146.
44. Gavarkovs AG, Burke SM, Reilly KC, Petrella RJ. 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-NP157.
45. Riley R, Coghill N, Montgomery A, Feder G, Horwood J. Experiences of patients and healthcare professionals of NHS cardiovascular health checks: a qualitative study. *J Public Health (Oxf)* 2016 Sep;38(3):543-551.
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 Mar;17(2):198-205.
47. Williams R, Rapport F, Elwyn G, Lloyd B, Rance J, Belcher S. The prevention of type 2 diabetes: general practitioner and practice nurse opinions. *Br J Gen Pract* 2004 Jul;54(504):531-535.
48. Graffy J, Grant J, Williams K, Cohn S, Macbay S, Griffin S, et al. More than measurement: practice team experiences of screening for type 2 diabetes. *Fam Pract* 2010 Aug;27(4):386-394.
49. Calnan M, Williams S. Coronary heart disease prevention: the role of the general practitioner. *Fam Pract* 1993 Jun;10(2):137-151.
50. Hulscher ME, van Drenth BB, Mokkink HG, van der Wouden JC, Grol RP. Barriers to preventive care in general practice: the role of organizational and attitudinal factors. *Br J Gen Pract* 1997 Nov;47(424):711-714.
51. Grant AM, Niyonsenga T, Dion I, Delisle E, Xhignesse M, Bernier R. Cardiovascular disease. Physician attitudes toward prevention and treatment. *Can Fam Physician* 1998 Apr;44:780-787.
52. Steptoe A, Doherty S, Kendrick T, Rink E, Hilton S. Attitudes to cardiovascular health promotion among GPs and practice nurses. *Fam Pract* 1999 Apr;16(2):158-163.
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 Jan;137(1-2):17-22.
54. Diehl K, Gansefort D, Herr RM, Gorig T, Bock C, Mayer M, et al. Physician Gender and Lifestyle Counselling to Prevent Cardiovascular Disease: A Nationwide Representative Study. *J Public Health Res* 2015 Jul 16;4(2):534.

55. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ* 2015 Jan 2;350:g7647.
56. Bully P, Sanchez A, Zabaleta-del-Olmo E, Pombo H, Grandes G. 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 Jul;76 Suppl:S76-93.
57. Ruge T, Nystrom L, Lindahl B, Hallmans G, Norberg M, Weinehall L, et al. Recruiting high-risk individuals to a diabetes prevention program: how hard can it be? *Diabetes Care* 2007 Jul;30(7):e61-2466.
58. Long GH, Johansson I, Rolandsson O, Wennberg P, Fharm E, Weinehall L, et al. Healthy behaviours and 10-year incidence of diabetes: a population cohort study. *Prev Med* 2015 Feb;71:121-127.
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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
60. Hiligsmann M, Wyers CE, Mayer S, Evers SM, Ruwaard D. A systematic review of economic evaluations of screening programmes for cardiometabolic diseases. *Eur J Public Health* 2017 Aug 1;27(4):621-631.
61. Dyakova M, Shantikumar S, Colquitt JL, Drew CM, Sime M, MacIver J, et al. Systematic versus opportunistic risk assessment for the primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2016 Jan 29;(1):CD010411. doi(1):CD010411.
62. Uthman OA, Hartley L, Rees K, Taylor F, Ebrahim S, Clarke A. Multiple risk factor interventions for primary prevention of cardiovascular disease in low- and middle-income countries. *Cochrane Database Syst Rev* 2015 Aug 4;(8):CD011163. doi(8):CD011163.
63. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009 Jul 21;6(7):e1000097.

Supplementary files

Supplementary file 1. Documentation of search strategies

University Library search consultation group

Date: February/March 2016

Topic/research question: Determinants of uptake of and compliance with selective prevention actions by individuals at high risk of cardio-metabolic disease and by healthcare professionals-a systematic review

Name of researcher(s): Axel C. Carlsson, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet

Librarian(s): Carl Gornitzki & Gun Brit Knutssön, University Library

Databases:

1. Medline (Ovid)
2. Embase (embase.com)
3. Cinahl (Ebsco)
4. PubMed (NOT Medline)

Total number of hits:

- Before deduplication: 10,566
- After deduplication: 6,683

1. Medline (Ovid)

<p>Date of Search: 2016-03-10</p> <p>Number of hits: 3,882</p> <p>Comments:</p>	<p>Field tags:</p> <ul style="list-style-type: none"> • ti,ab,kf = title, abstract & keyword • exp/ = MeSH, exploded • adj3 = within three words
<p>PRIMARY PREVENTION</p> <ol style="list-style-type: none"> 1. Primary Prevention/ 2. exp Health Promotion/ 3. Preventive Health Services/ 4. Mass Screening/ 5. (risk assess* or health check* or risk check or risk questionnair* or health promot* or screen*).ti,ab,kf. 6. (prevent* adj3 (primary or secondary or care or therapy or treatment or selective or program*)).ti,ab,kf. 7. or/1-6 <p>PARTICIPATION</p> <ol style="list-style-type: none"> 8. Patient participation/ 9. Motivation/ 10. exp Attitude to Health/ 11. exp Health Behavior/ 12. exp Health Personnel/ 13. exp "Attitude of Health Personnel"/ 14. exp Negativism/ 15. (participat* or non-participat* or nonparticipat* or attend* or nonattend or non-attend* or recruit* or uptake or response or nonresponse or non-response or responders).ti,ab,kf. 16. (complianc* or non-complianc* or noncomplianc* or barrier* or motiv* or willing* or challeng* or attitud* or adherenc* or nonadherenc* or non-adherenc* or incentiv* or engage* or retention or drop out* or dropout* or accept* or negativ* or nonacceptance or non-acceptance).ti,ab,kf. 17. or/8-16 <p>PRIMARY HEALTH CARE</p> <ol style="list-style-type: none"> 18. exp General Practice/ 19. Primary Health Care/ 20. General Practitioners/ 21. (primary adj3 (health or care)).ti,ab,kf. 22. ((general or family) adj3 (pract* or physician*)).ti,ab,kf. 23. or/18-22 <p>CARDIOMETABOLIC</p> <ol style="list-style-type: none"> 24. exp Stroke/ 25. exp Cardiovascular Disease/ 26. exp Renal Insufficiency, Chronic/ 27. exp Diabetes Mellitus/ 28. (hypertens* or (high adj3 blood pressur*) or atheroscleros* or atherogenes* or stroke* or cerebrovascul- lar accident* or (coronary adj3 disease*) or cardio* or (peripher* adj3 arter* adj3 disease*) or myocardial infarct* or heart attack* or angina pectoris or angor pectoris or stenocardia* or aortic aneurysm* or (tran- sient adj3 ischem* adj3 attack*) or (transient adj3 cerebral adj3 ischem*) or (chronic adj3 (renal or kidney) adj3 (disease* or insuffic* or failure)) or diabet*).ti,ab,kf. 29. or/24-28 <ol style="list-style-type: none"> 30. 7 and 17 and 23 and 29 31. remove duplicates from 30 	

2. Embase (embase.com)

Date of Search: 2016-03-10	Field tags:
Number of hits: 4,981	<ul style="list-style-type: none"> • ab,ti = title & abstract • /exp = Emtree, exploded • /de = Emtree, non-exploded • NEAR/3 = within three words
Comments:	
	Results
	4,981
#30 #29 AND ('article'/it OR 'review'/it)	7,552
#29 #27 NOT #28	4,912,694
#28 [animals]/lim NOT [humans]/lim	7,559
#27 #7 AND #15 AND #20 AND #26	4,289,275
#26 #21 OR #22 OR #23 OR #24 OR #25	2,136,699
#25 hypertens*:ab,ti OR (high NEAR/3 'blood pressur*'):ab,ti OR atheroscleros*:ab,ti OR atherogenes*:ab,ti OR stroke*:ab,ti OR 'cerebrovascular accident*':ab,ti OR (coronary NEAR/3 disease*):ab,ti OR cardio*:ab,ti OR (peripher* NEAR/3 arter* NEAR/3 disease*):ab,ti OR 'myocardical infarct*':ab,ti OR 'heart attack*':ab,ti OR 'angina pectoris':ab,ti OR 'angor pectoris':ab,ti OR stenocardia*:ab,ti OR 'aortic aneurysm*':ab,ti OR (transient NEAR/3 ischem* NEAR/3 attack*):ab,ti OR (transient NEAR/3 cerebralNEAR/3 ischem*):ab,ti OR (chronic NEAR/3 (renal OR kidney) NEAR/3 (disease* OR insuffic* OR failure)):ab,ti OR diabet*:ab,ti	716,813
#24 'diabetes mellitus'/exp	57,386
#23 'chronic kidney failure'/de	3,415,832
#22 'cardiovascular disease'/exp	237,804
#21 'cerebrovascular accident'/exp	

	300,424
#20 #16 OR #17 OR #18 OR #19	
#19 ((general OR family) NEAR/3 (pract* OR physician*)):ab,ti	123,502
#18 (primary NEAR/3 (health OR care)):ab,ti	131,016
#17 'primary health care'/exp	122,721
#16 'general practice'/de	73,962
#15 #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14	6,656,812
#14 complianc*:ab,ti OR 'non-complianc*':ab,ti OR noncomplianc*:ab,ti OR barrier*:ab,ti OR motiv*:ab,- ti OR willing*:ab,ti OR challeng*:ab,ti OR attitud*:ab,ti OR adherenc*:ab,ti OR nonadherenc*:ab,ti OR 'non-adherenc*':ab,ti OR incentiv*:ab,ti OR engage*:ab,ti OR retention:ab,ti OR 'drop out*':ab,ti OR dropout*:ab,ti OR accept*:ab,ti OR negativ*:ab,ti OR nonacceptance:ab,ti OR 'non-acceptance':ab,ti	3,004,155
#13 participat*:ab,ti OR 'non-participat*':ab,ti OR nonparticipat*:ab,ti OR attend*:ab,ti OR nonattend:ab,- ti OR 'non-attent*':ab,ti OR recruit*:ab,ti OR uptake:ab,ti OR response:ab,ti OR nonresponse:ab,ti OR 'non-response':ab,ti OR responders:ab,ti	3,146,649
#12 'health care personnel'/exp	1,100,293
#11 'health behavior'/exp	299,777
#10 'motivation'/de	79,278
#9 'health personnel attitude'/exp	144,414
#8 'patient attitude'/exp	287,964

	1,127,514
#7 #1 OR #2 OR #3 OR #4 OR #5 OR #6	
	209,017
#6 (prevent* NEAR/3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)):ab,ti	
	790,851
#5 'risk assess*':ab,ti OR 'health check*':ab,ti OR 'risk check':ab,ti OR 'risk questionair*':ab,ti OR 'health promot*':ab,ti OR screen*':ab,ti	
	178,443
#4 'mass screening'/exp	
	22,949
#3 'preventive health service'/de	
	76,434
#2 'health promotion'/exp	
#1 'primary prevention'/de	
	31,228

3. Cinahl (Ebsco)

Date of Search: 2016-03-10	Field tags:
Number of hits: 1,533	<ul style="list-style-type: none"> • MH = Cinahl Heading • N3 = Within three words • TI = Titel • AB = Abstract
Comments:	
S54	S33 AND S41 AND S47 AND S53
S53	S48 OR S49 OR S50 OR S51 OR S52
	TI ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardical infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*) OR AB ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardical infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*))
S52	
S51	(MH "Diabetes Mellitus+")
S50	(MH "Renal Insufficiency, Chronic+")
S49	(MH "Cardiovascular Diseases+")
S48	(MH "Stroke+")
S47	S42 OR S43 OR S44 OR S45 OR S46
	TI (((general OR family) N3 (pract* OR physician*))) OR AB (((general OR family) N3 (pract* OR physician*)))
S46	
S45	TI ((primary N3 (health OR care))) OR AB ((primary N3 (health OR care)))
S44	(MH "Physicians, Family")
S43	(MH "Primary Health Care")
S42	(MH "Family Practice")
S41	S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40
	TI ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance")) OR AB ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance"))
S40	
	TI ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders)) OR AB ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders))
S39	
S38	(MH "Health Personnel+")
S37	(MH "Attitude to Illness+")
S36	(MH "Attitude of Health Personnel+")



S35	(MH "Attitude to Health+")
S34	(MH "Motivation")
S33	S28 OR S29 OR S30 OR S31 OR S32
S32	TI ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*))) OR AB ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)))
S31	TI (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnair*" OR "health promot*" OR screen*)) OR AB (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnair*" OR "health promot*" OR screen*))
S30	(MH "Health Screening+")
S29	(MH "Health Promotion+")
S28	(MH "Preventive Health Care+")
S27	S6 AND S14 AND S20 AND S26
S26	S21 OR S22 OR S23 OR S24 OR S25
S25	TI ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardical infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*)) OR AB ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardical infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*))
S24	(MH "Diabetes Mellitus+")
S23	(MH "Renal Insufficiency, Chronic+")
S22	(MH "Cardiovascular Diseases+")
S21	(MH "Stroke+")
S20	S15 OR S16 OR S17 OR S18 OR S19
S19	TI (((general OR family) N3 (pract* OR physician*))) OR AB (((general OR family) N3 (pract* OR physician*)))
S18	TI ((primary N3 (health OR care))) OR AB ((primary N3 (health OR care)))
S17	(MH "Physicians, Family")
S16	(MH "Primary Health Care")
S15	(MH "Family Practice")
S14	S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13
S13	TI ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance")) OR AB ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance"))
S12	TI ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders)) OR AB ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders))

S11	(MH "Health Personnel+")
S10	(MH "Attitude to Illness+")
S9	(MH "Attitude of Health Personnel+")
S8	(MH "Attitude to Health+")
S7	(MH "Motivation")
S6	S1 OR S2 OR S3 OR S4 OR S5
S5	TI ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)) OR AB ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)))
S4	TI (("risk assess*" OR "health check*" OR "risk check" OR "risk questionair*" OR "health promot*" OR screen*)) OR AB (("risk assess*" OR "health check*" OR "risk check" OR "risk questionair*" OR "health promot*" OR screen*))
S3	(MH "Health Screening+")
S2	(MH "Health Promotion+")
S1	(MH "Preventive Health Care+")

4. PubMed


Date of Search: 2016-03-10	
Number of hits: 170	
Comments: PubMed NOT Medline]	
<pre> ((((((risk assess*[Title/Abstract] OR health check*[Title/Abstract] OR "risk check"[Title/Abstract] OR risk questionnair*[Title/Abstract] OR health promot*[Title/Abstract] OR screen*[Title/ Abstract])) OR (prevent*[Title/Abstract] AND (primary[Title/Abstract] OR secondary[Title/ Abstract] OR care[Title/Abstract] OR therapy[Title/Abstract] OR treatment[Title/Abstract] OR selective[Title/Abstract] OR program*[Title/Abstract]))) AND ((participat*[Title/Abstract] OR non-participat*[Title/Abstract] OR nonparticipat*[Title/ Abstract] OR attend*[Title/Abstract] OR nonattend[Title/Abstract] OR non-attend*[Title/Ab- stract] OR recruit*[Title/Abstract] OR uptake[Title/Abstract] OR response[Title/Abstract] OR nonresponse[Title/Abstract] OR non-response[Title/Abstract] OR responders[Title/Abstract] OR complianc*[Title/Abstract] OR non-complianc*[Title/Abstract] OR noncomplianc*[Title/ Abstract] OR barrier*[Title/Abstract] OR motiv*[Title/Abstract] OR willing*[Title/Abstract] OR challeng*[Title/Abstract] OR attitud*[Title/Abstract] OR adherenc*[Title/Abstract] OR nonadherenc*[Title/Abstract] OR non-adherenc*[Title/Abstract] OR incentiv*[Title/Abstract] OR engage*[Title/Abstract] OR retention[Title/Abstract] OR drop out*[Title/Abstract] OR dropout*[Title/Abstract] OR accept*[Title/Abstract] OR negativ*[Title/Abstract] OR nonaccep- tance[Title/Abstract] OR non-acceptance[Title/Abstract]))) AND (("primary health"[Title/Abstract] OR "primary care"[Title/Abstract])) OR (general pract* OT general physician*[Title/Abstract] OR family pract*[Title/Abstract] OR family physician*[Title/ Abstract])) AND ((hypertens*[Title/Abstract] OR "high blood pressur*" [Title/Abstract] OR atheroscleros*[Title/ Abstract] OR atherogenes*[Title/Abstract] OR stroke*[Title/Abstract] OR "cerebrovascular accident*" [Title/Abstract] OR "coronary disease*" [Title/Abstract] OR cardio*[Title/Abstract] OR "peripheral artery disease*" [Title/Abstract] OR "myocardial infarct*" [Title/Abstract] OR "heart attack*" [Title/Abstract] OR "angina pectoris" [Title/Abstract] OR "angor pectoris" [Title/ Abstract] OR stenocardia*[Title/Abstract] OR "aortic aneurysm*" [Title/Abstract] OR "transient ischemic attack*" [Title/Abstract] OR "transient cerebral ischemic" [Title/Abstract] OR "chronic renal" [Title/Abstract] OR "chronic kidney" [Title/Abstract] OR diabet*[Title/Abstract])) NOT medline[sb] </pre>	






Chapter 6

Willingness to participate in health checks for cardiometabolic diseases: a survey among primary health care patients in five European countries



Anne-Karien M. de Waard, Joke C. Korevaar, Monika Hollander, Mark M. J. Nielen, Bohumil Seifert, Axel C. Carlsson, Christos Lionis, Jens Søndergaard, François G. Schellevis, and Niek J. de Wit on behalf of the SPIMEU project group*

*SPIMEU project group also includes: Agapi Angelaki, Norbert Král, Anders Sonderlund and Per Wändell



Submitted



Abstract

Background: Since cardiometabolic diseases (CMD) are a frequent cause of death worldwide, preventive strategies are needed. Recruiting adults for a health check in primary care could help to identify persons at risk for CMD. For successful results, participation is crucial. We aimed to identify factors related to unwillingness to participate in CMD health checks across five countries.

Methods: A questionnaire was distributed among persons without known CMD consulting in general practice in the Czech Republic, Denmark, Greece, the Netherlands and Sweden and between January and July 2017 within the framework of the SPIMEU study.

Results: A total of 1,354 persons responded. Nine percent was unwilling to participate in a CMD health check. Male gender, smoking, higher self-rated health, never been invited before for a health check and not willing to pay for a health check were related to being unwilling to participate. The most frequent reason mentioned for unwillingness to participate was 'I think that I am healthy' (57%). Among the respondents who were willing to participate, 94% preferred an invitation by the general practitioner and 66% was willing to pay for a health check. The two most important reasons for willingness to participate were: 'I am curious to know my risk for cardiovascular disease / diabetes' (74%,) and 'I want to be healthier' (40%).

Conclusion: The minority of the respondents was unwilling to participate in a CMD health check with consistent results within the five countries. The majority considered general practice as the preferred supplier. Together this provides a promising starting point to improve participation rates in CMD health checks in primary care.

Background

Cardiometabolic diseases (CMD) are the number-one cause of death in the world.¹ They include cardiovascular disease (CVD), type 2 diabetes mellitus and chronic kidney disease. While mortality rates have dropped in recent years, the absolute number of CMD have increased, due to ageing and an unhealthy lifestyle with physical inactivity, smoking and an unhealthy diet as most important risk factors.²⁻⁷ Studies have shown that as much as 80% of CVD could be prevented or postponed if risk factors in lifestyle and behaviour could be eliminated.⁸

Selective prevention entails the identification of persons at high risk of CMD, but who are currently asymptomatic and without known risk factors or established CMD, followed by interventions to reduce their level of risk. As such, recruiting adults for a health check and performing a CMD risk assessment is the first step to identify persons at risk. Although scientific evaluation showed conflicting results of general health checks on morbidity and mortality,^{9,10} performing health checks and starting interventions in primary care (PC) have been associated with improvements in CMD intermediate risk factors like body mass index (BMI), blood pressure and total cholesterol level, as well as an improvement in lifestyle.¹¹⁻¹⁴

To optimize identification of persons at high risk of CMD, participation in health checks should be as high as possible. However, actual participation rates in health checks widely differ between countries ranging from 33% in an online risk estimation as first step in a CMD health check in the Netherlands¹⁵ to 65% for a health check in primary care in Sweden.¹⁶ These numbers demonstrate that there is room for improvement of participation rates in CMD health checks. Various factors have been reported to be positively related to participation including higher age,¹⁷⁻²¹ being female^{20,22} and not smoking,^{20,22-26} but results are conflicting and most studies have been done in the United Kingdom and the Netherlands.

Willingness for participation can be seen as a precondition for actual participation. An earlier study concerning willingness to participate in a CMD health check, showed that 56% of the respondents intended to participate and their willingness to participate could increase to 80-90% by removing barriers for participation.²⁷ This study, however, was only performed in the Netherlands.

The organisation of (primary) health care differs between countries.²⁸ Currently it is unclear which factors are associated with unwillingness of persons to participate in health checks, and whether these factors differ between countries. Furthermore, the preferred way of the organisation of CMD health

checks is currently unclear. More insight in these factors could eventually help to improve actual participation rates. Therefore, we conducted a survey to assess the prevalence and personal characteristics associated with unwillingness to participate in a CMD health check, reasons for being (un)willing to participate and the preferred organisation of a CMD health check.

Methods

Study design

This survey was performed as part of the SPIMEU project (Determinants of successful implementation of selective prevention of cardiometabolic diseases across Europe), a collaborative cross-European project, which aims to identify determinants of successful implementation of programmatic selective prevention of CMD in primary care across Europe.²⁹

A questionnaire assessing the willingness to participate in a health check was distributed between January and July 2017 by general practitioners (GPs) in five countries: the Czech Republic, Denmark, Greece, the Netherlands and Sweden and among consulting patients. The GPs were free to choose the method for distribution of the questionnaire. GPs received a remuneration for every returned questionnaire varying from €2,15 to €7,60. In Sweden no remuneration was provided. Detailed information about the data collection in each country are given in Supplementary file 1.

Study population

Persons consulting the practice for any complaint who fulfilled the in- and exclusion criteria were invited to complete the questionnaire.

Inclusion criteria

- 19 years of age or older
- Sufficient reading and writing skills to complete the questionnaire

Exclusion criteria

- History of:
 - Myocardial infarction
 - Angina pectoris
 - Heart failure
 - Stroke (ischemic, haemorrhagic)

- o Transient Ischemic Attack (TIA)
- o Peripheral arterial disease
- o Diabetes mellitus
- o Chronic renal failure
- o Hypertension with use of antihypertensive medication
- o Hypercholesterolemia with use of lipid lowering drugs

Questionnaire

We developed a semi-structured questionnaire in English which was largely based on previous work.²⁷ We described the term 'health check' in the questionnaire as: 'a health check for CMD, which aims to identify the persons at high risk of CMD. This health check could be very broad, ranging from a short online questionnaire to a detailed health check at the doctor's office including physical examination and laboratory tests.

To increase the response and comprehensibility, the initial English questionnaire was pilot tested by two independent persons with good knowledge of the English language and without a medical background. After testing and improving the questionnaire, the original English version was translated into the national language of the participating countries by a native speaker and subsequently translated back by a different person, who was well experienced in English, without knowledge of the original English version. The initial and translated versions were compared and mismatches were discussed by the SPIMEU partners from the respective country and adapted if necessary. The questionnaire was provided in five languages: Czech, Danish, Dutch, Greek and Swedish. Further details are given in Supplementary file 1.

The printed questionnaires were sent to the GPs and after completion by the respondents they were anonymously returned by the GPs to the project representative in each country and entered in an online data-entry programme. To be able to trace the original questionnaires back to check the data-entry process, each questionnaire was numbered.

Statistical analysis

The main outcome was being unwilling to participate in a health check ('Suppose you would be invited for a health check, would you participate?' Answer options: yes or no). Independent variables were:

- Personal characteristics
 - Age: divided in 4 categories: <40, 40-55, 56-70 and >70 years of age
 - Gender: male or female
 - Education level: low (no education, primary school), middle (secondary school, high-school), high (vocational training, University)
 - Job status: (Self)employed, looking for work, not working, student/other
 - Living situation: alone, together

- CMD risk factors
 - BMI: <25: normal BMI, 25-30: overweight, >30: obesity
 - Smoking: currently smoking, not smoking or smoked in the past
 - Alcohol consumption: low: <6 alcoholic drinks per day on <1 time per week
 - Physical activity: high: ≥ 5 days with >30 minutes of physical activity
 - Family history of CVD or diabetes (yes / no)
 - Self-rated health: Measured on a scale from 0 (very bad health) to 10 (very good) Good health was defined as the median score, which was 7 or higher.

- Invitation to a health check before and willingness to pay for a health check (yes / no).

We performed univariable analyses and reported odds ratio's (OR) for the association between the independent variables and the outcome unwillingness to participate in a health check. Only respondents who answered the outcome question were included in the analysis. For the other questions, we excluded cases with missing data from the analyses. Frequencies and ORs were calculated for all countries combined and stratified for country. We considered a p-value of less than 0.05 as statistically significant. Due to the low number of respondents who were unwilling to participate in a health check, we decided not to focus on significance levels when exploring the differences between countries. We only describe the factors in the text which were significant in the analysis for all countries combined and from which the OR for being unwilling to participate in the analysis per country was opposite to this overall effect.

Ethical considerations

In all five countries the appropriate ethical procedures were followed. In the Czech Republic, Denmark, Greece and Sweden the protocol was reviewed and approved by the ethical boards, whereas in the Netherlands the ethical review boards declared that medical ethical approval was not required for this study. In Greece an information sheet about the study was provided and written informed consent was given by the participants at the beginning of the questionnaire of (protocol number 11138-05/08/2016). In the other four countries the need for consent was deemed unnecessary according to national regulations with protocol numbers 100/16 for the Czech Republic, 16/41062 for Denmark, number 16/679 for the Netherlands and 2016/2190-32 for Sweden.

Results

Characteristics of the respondents

In total 1,531 persons completed the questionnaire, ranging from 193 in Denmark to 404 in the Czech Republic. The participating GPs did not keep record of the number of persons who received the questionnaire, so we were not able to calculate a response rate. We excluded 161 respondents who indicated to have a CMD and 16 respondents who did not answer the question on willingness to participate. In total 1,354 questionnaires were suitable for analysis. The baseline characteristics are presented in Table 1.

Unwillingness to participate

In total 124 respondents (9%) reported to be unwilling to participate, varying from ten respondents (5%) in Denmark to 43 (14%) in Greece (Table 3). Males, smokers and respondents with a high self-rated health were more often unwilling to participate (OR 1.48 (95% CI 1.02-2.14), 1.88 (95% CI 1.25-2.82) and 1.51 (95% CI 1.04-2.20), respectively (Table 2). Respondents who had not been invited for a CMD health check before (OR 2.24; 95% CI 1.15-4.36) or who were not willing to pay (OR 3.09; 95% CI 2.11-4.53) were also more often unwilling to participate (Table 2, Figure 1).

Table 1. Baseline characteristics of survey respondents

	the Czech Republic N=404	Denmark N= 193	Greece N=300	the Netherlands N=247	Sweden N=210	Total N= 1354
<i>Age (%)</i>						
<40	56	45	37	42	44	46
40-55	28	31	48	35	35	35
56-70	14	21	13	18	18	16
>70	2	3	2	6	4	3
<i>Male (%)</i>	42	36	48	34	25	39
<i>Education^a (%)</i>						
Low	5	16	12	3	8	8
Middle	43	26	28	17	25	30
High	52	59	60	81	67	62
<i>Job status^b (%)</i>						
(Self)employed	82	73	64	65	67	71
Looking for work	3	3	11	3	2	4
Not working ^b	8	14	18	17	17	14
Student, other	7	10	7	16	14	10
<i>Living situation^c (%)</i>						
Alone	18	18	20	12	19	17
Together	82	82	80	88	81	83
<i>BMI^d (kg/m²) (%)</i>						
BMI <25	57	54	41	54	59	53
BMI 25-30	33	32	42	34	33	35
BMI >30	10	14	17	13	9	13
<i>Currently smoking^e (%)</i>	21	18	37	17	7	21
<i>Low alcohol consumption^f (%)</i>	98	98	98	97	97	98
<i>High physical activity^g (%)</i>	28	20	15	32	18	23
<i>No family member with CVD/DM II^h (%)</i>	58	65	54	55	59	58
<i>Self-rated healthⁱ median (SD)</i>	7.0 (1.9)	7.2 (2.0)	7.2 (2.1)	6.7 (2.1)	6.9 (1.8)	7.0 (2.0)
<i>Invited for a health check before (%)</i>	20	17	18	9	9	16

a: Low: No education, primary school, middle: Secondary school/high-school, high: Vocational training, University

b: Not working because of poor health, fulltime house person, retired

c: Living together: living with partner, children and/or parents

d: BMI: Body mass index. <25: normal BMI, 25-30: overweight, >30: obesity

e: Smoking: At least one cigarette per day

f: Low alcohol consumption: <6 alcoholic drinks per day <1 time per week

g: High physical activity: ≥5 days/week ≥30 min

h: CVD: Cardiovascular disease, onset before the age of 60, DM II: diabetes mellitus type 2

i: Scale from 1-10, 1 very bad health 10 very good health

Table 2. Factors associated with unwillingness to participate in a health check

		Univariable		
		OR	95% CI	p-value
Age	<40	1		
	40-55	1.49	0.99-2.24	0.059
	56-70	1.08	0.61-1.90	0.797
	>70	0,90	0.27-3.02	0.868
Gender	Male	1.48	1.02-2.14	0.040
Education level ^a	High	1		
	Middle	1.05	0.69-1.59	0.818
	Low	1.30	0.68-2.48	0.430
Job status ^b	Not (self) employed	1.39	0.94-2.05	0.101
Living situation ^c	Living alone	1.47	0.94-2.30	0.092
BMI (kg/m ²) ^d	< 25	1		
	25-30	1.41	0.94-2.12	0.097
	>30	1.17	0.64-2.13	0.607
Smoking status ^e	Currently smoking	1.88	1.25-2.82	0.002
Alcohol consumption ^f	Low	1.01	0.30-3.30	0.991
Physical activity ^g	High	1.19	0.78-1.83	0.413
Fam. Hist of CVD / DM II ^h	No	1.36	0.92-2.00	0.120
Self-rated health ⁱ	≤7 not good	1		
	>7, good	1.51	1.04-2.20	0.031
Invited for health check before	No or don't know	2.24	1.15-4.36	0.017
Willing to pay for health check	No	3.09	2.11-4.53	<0.001

OR: Odds Ratio, 95%CI: 95% confidence interval

a Low: No education, primary school, middle: Secondary school/high-school, high: Vocational training, University

b Not (self) employed includes looking for work, not working because of poor health, fulltime house person or being retired, being a student or other

c Living together: living with partner, children and/or parents

d BMI: Body mass index

e Smoking: At least one cigarette per day

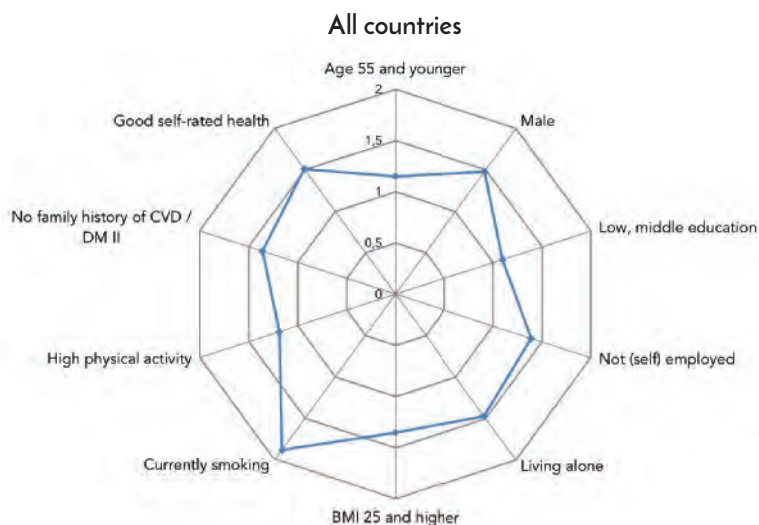
f Low alcohol consumption: <6 alcoholic drinks per day on <1 time per week

g High physical activity: ≥5 days/week ≥30 min

h CVD: Cardiovascular disease, onset before the age of 60, DM II: type 2 diabetes mellitus

i Scale from 1-10, 1 very bad health 10 very good health

Figure 1. Odds ratios of factors associated with unwillingness to participate in a cardiometabolic health check



Legend

Age 55 and younger, reference group: 56 and older

Male, reference group: female

Low, middle education. Reference group: high education. Low: No education, primary school, middle: Secondary school/high-school, high: Vocational training, University

Not (self) employed, reference group: self-employed. Not (self) employed includes looking for work, not working because of poor health, fulltime house person, being retired, or being a student or other

Living alone, reference group: Living together: living with partner, children and/or parents

BMI: Body mass index 25 and higher. Reference group: BMI below 25

Currently smoking at least one cigarette per day Reference group: smoking in de past or not smoking.

High physical activity: ≥ 5 days/week ≥ 30 min. Reference group: low physical activity, < 5 days/week

No family history of CVD / DMII, Reference group: family history of CVD / diabetes CVD: Cardiovascular disease, onset before the age of 60, DM II: type 2 diabetes mellitus

Good self-rated health: > 7 . Reference group: self-rated health below median ≤ 7 . Scale from 1-10, 1 very bad health 10 very good health

Country specific factors associated with being unwilling to participate

Supplementary file 3 shows the factors associated with unwillingness to participate per country. Overall, males, smokers and respondents with a good self-rated health were less often willing to participate in all countries. However, in Sweden, males (OR 0.85) smokers (OR 0.78) and respondents with a good self-rated health (OR 0.79) and in the Netherlands smokers (OR 0.95) were more often willing to participate.

Reasons for being unwilling to participate

The reasons for being unwilling to participate differed between the countries. 'I think that I am healthy' was mentioned most frequently (57%), ranging from 44% in Greece to 90% in Denmark. In the Czech Republic, Greece and the Netherlands 'I already have regular medical check ups' was often a reason for being unwilling to participate (18, 23 and 28% respectively). In Greece 'I do not have time to participate' and 'I am afraid that the results of the health check might be negative' were mentioned often (30% and 21% respectively) compared to 0-18% and 0-4% in the other countries. No access to the internet (0%), being too old (3%) and interference of others in personal health (3%) were the least frequently mentioned reasons in all the countries for being unwilling to participate.

Willingness to participate

Payment

Among the respondents who were willing to participate (n=1230), more than half (66%, ranging from 49% in Denmark to 81% in Sweden) would pay for a health check including laboratory tests. In contrast with the other four countries (2%-5%), 11% of those willing to participate in Greece indicated to be willing to pay more than €100 for the health check (Table 3).

Reasons for participation

The two most important reasons in each country for being willing to participate were: 'I am curious to know my risk for CVD / diabetes' (74%, range 57-86%) and 'I want to be healthier'(40%, range 29-44%). In the Netherlands 22% reported 'because I think I have a high risk of CVD or diabetes' whereas in Sweden, Greece, the Czech Republic and Denmark the corresponding percentages were 15, 15, 14 and 8% respectively. In Greece, the Czech Republic, the Netherlands and Sweden 'only if the doctor insists that I participate' was reported by 14, 10, 5 and 4% respectively, whereas in Denmark this was less than 1%. The influence of close relatives was a reason for willingness to participate for only 2% (range <1-4%).

Preferences for the organisation of CMD health checks

More than 90% of the respondents who were willing to participate would like to be invited by their GP, but also a medical specialist (37%) or practice nurse

(24%) were considered as suitable options. Most respondents (64%) preferred to receive an invitation either by a letter or telephone call, especially in the Netherlands (84%) and Sweden (85%). In Denmark the preferred method was digital (74%), so by e-mail, a website, social media or a text message on a mobile phone. On average 91% preferred to have a broader health check, including also screening for example for cancer and depression.

Discussion

Key findings

Unwillingness to participate in a CMD health check was low in all countries. Male gender, smoking and a good self-rated health were associated with being unwilling to participate. The most important reason for unwillingness to participate was 'I think that I am healthy'. Important reasons for willing to participate were 'I am curious to know my risk for CVD / diabetes' and 'I want to be healthier'. Among those willing to participate, most would like to be invited by the GP and more than half was willing to pay for it.

Results in the light of the literature

The availability and organisation of selective prevention programmes, including a health check to identify the people at risk for disease, differs between countries. In the Czech Republic, GPs offers a national CMD health check, which is totally reimbursed for the participants.³⁰ In the Netherlands a guideline for a step-wise health check to identify persons at high risk is available, yet implementation fails because it is not reimbursed.³¹ In Sweden¹⁶ a health check is available in only one county (Västerbotten), which is a different county than the one where our survey was performed (Stockholm) (Supplementary file 2). In Denmark and Greece, currently no health check is available. Remarkably, willingness to participate was the highest in the country where no health check exists (Denmark). Furthermore, willingness to participate was consistently high among the five countries. This implicates that willingness among persons to participate is not influenced by the availability of a CMD health check within a country.

According to the literature, actual participation in CMD health checks ranged from 33%¹⁵ in the Netherlands, to 37%- 66% in Denmark³² and 65%¹⁶ in Sweden. Obviously there is a wide gap between the willingness to participate and the actual participation in CMD health checks. Varying barriers may hamper to turn the willingness into actual participation. According to the literature

Table 3. Preferred situation for a health check for CMD by country

	the Czech Republic	Denmark	Greece	the Netherlands	Sweden	Total
Willingness to participate %	93	95	86	90	91	91
Willing to participate n	n= 376	n= 183	n=257	n= 222	n=192	n=1230
<i>Preferred invitation by (%)^{a,c}</i>						
GP	95	95	89	93	92	93
Pharmacist	4	3	8	7	26	9
Occupational HCP	15	10	11	19	60	21
Medical specialist	33	24	21	42	71	37
Municipal health service	2	18	13	25	42	17
National health service	3	32	18	24	30	18
Practice nurse	24	13	8	18	63	24
Allied healthcare professional ^b	9	15	6	10	51	16
Researchers, other	6	19	10	14	54	18
<i>Preferred invitation method (%)^c</i>						
At home ^d	57	58	54	84	85	64
Digitally ^d	61	74	39	57	54	56
During visit to doctor	65	57	45	40	64	55
Commercials, other	1	5	5	<1	8	4
<i>Willingness to pay (%)^c</i>						
Don't want to pay	22	51	44	41	19	34
€0-€10	23	6	4	3	11	11
€11-€20	33	16	7	11	33	21
€21-€50	14	19	25	25	26	21
€51-€100	4	5	10	18	8	8
Over €100	5	3	11	2	3	5
<i>Reasons to participate (%)^c</i>						
I am curious to know my risk of CVD/ diabetes	72	86	57	83	78	74
I think I have a high risk of CVD/diabetes	14	8	15	22	15	15
I want to be healthier	41	38	44	29	44	40
Only if my partner, family or friends insists that I participate	2	3	4	<1	2	2
Only if the doctor insists that I participate	10	<1	14	5	4	8
Combined health check ^{c, e}	93	97	88	85	94	91

a: More answers possible.

b E.g. dietician or physiotherapist.

c: % of respondents willing to participate.

d: At home: letter, call. Digitally: e-mail, social media, text message on mobile phone.

e: 'I prefer to have a health check that also includes other diseases such as depression and cancer'.

GP, general practitioner; HCP, health care provider.

barriers for actual participation in health checks were being male, smoking, being unemployed, having a low SES and being younger.^{20,22-26,33} Examples of organisational barriers for actual participation were lack of time,³⁴⁻³⁷ difficulties to access the practice^{38,39} or fear for a positive outcome of the health check.^{37,40}

In all five countries the majority of the respondents prefer to be invited by the GP (89-95%). These findings support the recommendation of the European Society for Cardiology guideline⁸ which states that in many countries 'GPs are in a unique position to provide selective CMD prevention and consider prevention as their task'.⁴¹ The consistency across countries is remarkable, since the position of the GP in the health care system differs between these countries. For example in the Czech Republic, Denmark and Greece there is no formal gatekeeping system, so people have access to the specialist without interference of the GP, however there are incentives when patients are referred by the GP. In Sweden and the Netherlands a (partial) gatekeeper system is in place.⁴² Furthermore, the strength of primary care has been identified to be less strong in Greece and Sweden than in the Czech Republic, Denmark and the Netherlands.²⁸

The willingness to pay for a health check differed between countries. The willingness to pay seemed not to be consistently related to the different reimbursement policies in the various countries. For example Danish participants were least willing to pay for a health check, which may be due to the fact that persons do not have to pay for most of the services in general practice with the exception of medicine.⁴³ In contrast in Greece more persons pay privately for their health care, so they might be used to pay for it and are therefore also more willing to pay for a health check.⁴⁴ However, in the Czech Republic people also do not have to pay for most of their health care, but the majority was willing to pay for a health check.⁴⁵

To maximize the attendance rate for health checks, it is important to use an 'active' invitation method using for example either telephone calls or personal letters which has been demonstrated to be more effective than a 'passive' invitation using flyers and posters.¹⁵ A lesson from our study was that among the methods of active invitation, an invitation by mail or telephone would be the preferred method, only in Denmark digital methods (website, e-mail, text message) were preferred.

The majority of our respondents preferred a combined health check with other diseases such as cancer and depression. This might be very efficient, since for example cancer has common risk factors with CVD⁴⁶ such as obesity⁴⁷ and

smoking,⁴⁸ and depression itself is a risk factor for CVD.⁴⁹ However, a health check for multiple diseases is only possible when the target population for screening is overlapping (e.g. the same age range). Organisation of multi disease prevention programmes would be challenging as they would require more steps, more time and more money to organise.

Strengths and limitations

The method GPs used to distribute the questionnaire among their patients was not fixed. Therefore we were not able to calculate a response rate. Further, the number of respondents who were unwilling to participate was very low. Therefore, a multivariable analysis was not possible. We used the ORs to give an overview of the results per country, but since the numbers were small, the factors and reasons for unwillingness for participation should be interpreted with caution, especially when individual countries were analysed.

In an earlier study the willingness to participate in health checks for CMD was lower (56%) than in our study.²⁷ This may be explained by the different selection of the participants. In this previous study, persons from an already existing panel, consisting of a representative population sample in the Netherlands were invited. These people are regularly invited to complete a questionnaire, and are used to respond on questionnaires about several subjects. In our study consulting patients were invited to respond to the survey, which might especially attract the persons who find the subject interesting and have a positive attitude towards prevention, thus leading to a more positive view on the intention to participate in a CMD health check. A strength of our study is that we were able to distribute the same questionnaire in five countries with different (primary) healthcare systems, which facilitates direct cross country comparisons.

Implications

Given the wide gap between the willingness to participate in our study and the actual participation in health checks according to the literature, we recommend to pay attention to remove barriers for actual participation as much as possible. Costs for the health check seem to be of less importance since the majority was willing to pay, however differences were seen between the countries.

Conclusions

We conclude that only the minority of the respondents was unwilling to participate in a CMD health check with consistent results within the five countries. The majority considered general practice as the preferred supplier. Together this provides a promising starting point to improve participation rates in CMD health checks in primary care.

Abbreviations

CMD: cardiometabolic disease, CVD: cardiovascular disease, PC: primary care, BMI: body mass index, TIA: transient ischemic attack, OR: odds ratio, HCP: health care provider

Declarations

Ethics approval and consent to participate: In all five countries the appropriate ethical procedures were followed. In the Czech Republic, Greece and Sweden the protocol was reviewed and approved by the ethical boards, whereas in Denmark and the Netherlands the ethical review boards declared that medical ethical approval was not required for this study.

Completing interests: The authors declare that they have no competing interests

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

Authors' contributions

1. AW, JK, MH, FS and NW contributed to conception and/or design of the manuscript, all authors were involved in acquisition of data. AW, JK, MH, MN, FS and NW contributed to the analysis and interpretation of data
2. AW, JK, MH, FS and NW drafted the manuscript, JK, MH, MN, BS, AC, CL, JS, FS, NW, AA, NK AS and PW critically revised the manuscript.
3. All authors read and approved the final manuscript
4. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Acknowledgements

We would like to thank all the participating GPs for the distribution of the questionnaires in their practice. Furthermore we would like to thank the respondents for completing the questionnaire.

References

1. WHO. Cardiovascular diseases. 2016; Available at: <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed 06/15, 2018.
2. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010 Jan;87(1):4-14.
3. James WP. The epidemiology of obesity: the size of the problem. *J Intern Med* 2008 Apr;263(4):336-352.
4. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001 Nov 27;104(22):2746-2753.
5. Deaton C, Froelicher ES, Wu LH, Ho C, Shishani K, Jaarsma T. The global burden of cardiovascular disease. *Eur J Cardiovasc Nurs* 2011 Jul;10 Suppl 2:S5-13.
6. WHO. World Population Ageing 1950-2050. 2002; Available at: <http://www.un.org/esa/population/publications/worldageing19502050/>. Accessed 02/24, 2017.
7. Atlas Writing Group, Timmis A, Townsend N, Gale C, Grobbee R, Maniadakis N, et al. European Society of Cardiology: Cardiovascular Disease Statistics 2017. *Eur Heart J* 2018 Feb 14;39(7):508-579.
8. 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
9. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
10. Jorgensen T, Jacobsen RK, Toft U, Aadahl M, Glumer C, Pisinger C. Effect of screening and lifestyle counselling on incidence of ischaemic heart disease in general population: Inter99 randomised trial. *BMJ* 2014 Jun 9;348:g3617.
11. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.
12. Unal B, Critchley JA, Capewell S. Modelling the decline in coronary heart disease deaths in England and Wales, 1981-2000: comparing contributions from primary prevention and secondary prevention. *BMJ* 2005 Sep 17;331(7517):614.

13. Forster AS, Burgess C, Dodhia H, Fuller F, Miller J, McDermott L, et al. Do health checks improve risk factor detection in primary care? Matched cohort study using electronic health records. *J Public Health (Oxf)* 2016 Sep;38(3):552-559.
14. van den Brekel-Dijkstra K, Rengers AH, Niessen MA, de Wit NJ, Kraaijenhagen RA. Personalized prevention approach with use of a web-based cardiovascular risk assessment with tailored lifestyle follow-up in primary care practice--a pilot study. *Eur J Prev Cardiol* 2016 Mar;23(5):544-551.
15. Van der Meer V, Nielen MM, Drenthen AJ, Van Vliet M, Assendelft WJ, Schellevis FG. Cardiometabolic prevention consultation in the Netherlands: screening uptake and detection of cardiometabolic risk factors and diseases--a pilot study. *BMC Fam Pract* 2013 ;14:29.
16. Norberg M, Blomstedt Y, Lonnberg G, Nystrom L, Stenlund H, Wall S, et al. Community participation and sustainability - evidence over 25 years in the Vasterbotten Intervention Programme. *Glob Health Action* 2012 Jan;5(1):19166.
17. Robson J, Dostal I, Sheikh A, Eldridge S, Madurasinghe V, Griffiths C, et al. The NHS Health Check in England: an evaluation of the first 4 years. *BMJ Open* 2016 Jan 13;6(1):e008840-2015-008840.
18. Dalsgaard E, Lauritzen T, Christiansen T, Mai KS, Borch-Johnsen K, Sandbæk A. Socioeconomic factors related to attendance at a Type 2 diabetes screening programme. *Diabetic Med* 2009;26(5):518-525.
19. Dalton AR, Bottle A, Okoro C, Majeed A, Millett C. Uptake of the NHS Health Checks programme in a deprived, culturally diverse setting: cross-sectional study. *J Public Health (Oxf)* 2011 Sep;33(3):422-429.
20. Klijs B, Otto SJ, Heine RJ, van der Graaf Y, Lous JJ, de Koning HJ. Screening for type 2 diabetes in a high-risk population: study design and feasibility of a population-based randomized controlled trial. *BMC Public Health* 2012 Aug 17;12:671-2458-12-671.
21. Attwood S, Morton K, Sutton S. Exploring equity in uptake of the NHS Health Check and a nested physical activity intervention trial. *J Public Health (Oxf)* 2016 Sep;38(3):560-568.
22. Lang SJ, Abel GA, Mant J, Mullis R. Impact of socioeconomic deprivation on screening for cardiovascular disease risk in a primary prevention population: a cross-sectional study. *BMJ Open* 2016 Mar 21;6(3):e009984-2015-009984.
23. Waller D, Agass M, Mant D, Coulter A, Fuller A, Jones L. Health checks in general practice: another example of inverse care? *BMJ* 1990 Apr 28;300(6732):1115-1118.
24. Davies G, Pyke S, Kinmonth AL. Effect of non-attenders on the potential of a primary care programme to reduce cardiovascular risk in the population. Family Heart Study Group. *BMJ* 1994 Dec 10;309(6968):1553-1556.

25. Lambert AM, Burden AC, Chambers J, Marshall T, Heart of Birmingham Teaching Primary Care Trust. Cardiovascular screening for men at high risk in Heart of Birmingham Teaching Primary Care Trust: the 'Deadly Trio' programme. *J Public Health (Oxf)* 2012 Mar;34(1):73-82.
26. Hoebel J, Starker A, Jordan S, Richter M, Lampert T. Determinants of health check attendance in adults: findings from the cross-sectional German Health Update (GEDA) study. *BMC Public Health* 2014;14:913.
27. Petter J, Reitsma-van Rooijen MM, Korevaar JC, Nielen MM. Willingness to participate in prevention programs for cardiometabolic diseases. *BMC Public Health* 2015 Jan 31;15:44-015-1379-0.
28. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.
29. SPIMEU research team. Website SPIMEU project. 2017; Available at: www.spimeu.org. Accessed 04, 2017.
30. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.
31. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
32. Christensen B. Characteristics of attenders and non-attenders at health examinations for ischaemic heart disease in general practice. *Scand J Prim Health Care* 1995 Mar;13(1):26-31.
33. Dryden R, Williams B, McCowan C, Themessl-Huber M. What do we know about who does and does not attend general health checks? Findings from a narrative scoping review. *BMC Public Health* 2012;12(1):723.
34. Wall M, Teeland L. Non-participants in a preventive health examination for cardiovascular disease: characteristics, reasons for non-participation, and willingness to participate in the future. *Scand J Prim Health Care* 2004 Dec;22(4):248-251.
35. Pill R, Stott N. Invitation to attend a health check in a general practice setting: the views of a cohort of non-attenders. *J R Coll Gen Pract* 1988 Feb;38(307):57-60.
36. Nielsen KD, Dyhr L, Lauritzen T, Malterud K. You can't prevent everything anyway: a qualitative study of beliefs and attitudes about refusing health screening in general practice. *Fam Pract* 2004 Feb;21(1):28-32.
37. Jenkinson CE, Asprey A, Clark CE, Richards SH. Patients' willingness to attend the NHS cardiovascular health checks in primary care: a qualitative interview study. *BMC Fam Pract* 2015 Mar 8;16:33-015-0244-7.

38. Ellis N, Gidlow C, Cowap L, Randall J, Iqbal Z, Kumar J. A qualitative investigation of non-response in NHS health checks. *Arch Public Health* 2015 Mar 30;73(1):14-015-0064-1. eCollection 2015.
39. Burgess C, Wright AJ, Forster AS, Dodhia H, Miller J, Fuller F, et al. Influences on individuals' decisions to take up the offer of a health check: a qualitative study. *Health Expect* 2015 Dec;18(6):2437-2448.
40. Jones A, Cronin PA, Bowen M. Comparison of risk factors for coronary heart disease among attenders and non-attenders at a screening programme. *Br J Gen Pract* 1993 Sep;43(374):375-377.
41. Nielen MM, Assendelft WJ, Drenthen AJ, van den Hombergh P, van Dis I, Schellevis FG. Primary prevention of cardio-metabolic diseases in general practice: a Dutch survey of attitudes and working methods of general practitioners. *Eur J Gen Pract* 2010 Sep;16(3):139-142.
42. Kringos DS, Boerma WG, Hutchinson A, Saltman RB. Building primary care in a changing Europe. : WHO Regional Office for Europe; 2015.
43. Olejaz M, Nielsen AJ, Rudkjoberg A, Birk HO, Krasnik A, Hernández-Quevedo C. Denmark, health system review. 2012; Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/160519/e96442.pdf?ua=1. Accessed 08/16, 2017.
44. Economou C. Greece, health system review. 2010; Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/130729/e94660.pdf?ua=1. Accessed 08/16, 2017.
45. Alexa J, Recka L, Votápková J, van Ginneken E, Spranger A, Wittenbecher F. Czech Republic, health system review. 2015; Available at: http://www.euro.who.int/__data/assets/pdf_file/0005/280706/Czech-HiT.pdf?ua=1. Accessed 08/16, 2017.
46. Masoudkabar F, Sarrafzadegan N, Gotay C, Ignaszewski A, Krahn AD, Davis MK, et al. Cardiovascular disease and cancer: Evidence for shared disease pathways and pharmacologic prevention. *Atherosclerosis* 2017 Aug;263:343-351.
47. Garg SK, Maurer H, Reed K, Selagamsetty R. Diabetes and cancer: two diseases with obesity as a common risk factor. *Diabetes Obes Metab* 2014 Feb;16(2):97-110.
48. Office of the Surgeon General (US), Office on Smoking and Health (US). Atlanta (GA): Centers for Disease Control and Prevention (US). 3, Cardiovascular Diseases. The Health Consequences of Smoking: A Report of the Surgeon General.: Available from: <https://www.ncbi.nlm.nih.gov/books/NBK44704/>; 2004.
49. Rozanski A, FAU BJ, Kaplan J. Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation JID - 0147763 0517*.

Supplementary files

Supplementary file 1. Methods per country

The Czech Republic: We distributed questionnaires among 15 GPs who previously agreed to participate (in a questionnaire which was distributed earlier among GPs for the SPIMEU project), each received 40 questionnaires. In total 14 GPs participated. All were from Prague and surrounding areas Every practitioner was educated and was provided with supporting information in printed form. Two reminders were sent every 14 days. Practitioners handed out questionnaires to patients during regular visits. The remuneration for a GP was 200 Czech crowns (€7,60) for one completed questionnaire. The project was conducted in accordance with the approval of the ethics committee of General University Hospital in Prague (Protocol number 100/16).

Denmark: We invited 28 GPs by email who had previously agreed to participate (in a questionnaire which was distributed earlier among GPs for the SPIMEU project). We also informed the invited GPs that they would receive 400 D.kr in remuneration for their participation. Of the total sample of 28 invited GPs, 15 agreed to participate. Once GPs agreed to participate, we sent the necessary materials to their clinic (an instruction sheet for the GP, information concerning the SPIMEU project and the specific study for the patients, 25 patient questionnaires and 25 prepaid return envelopes). We suggested that they either give the questionnaires to their patients to fill out in the waiting room, or to take home with them after their appointment. We have not spoken to any participating GPs about this, however, so we have no way of knowing exactly how they distributed the questionnaire. A remuneration of 400 D.kr (≈€54) was given to the GPs after sending back the completed questionnaires. The study was approved by the National Committee on Health Research Ethics and the Danish Data Protection Agency (Protocol number 16/41062).

Greece: Invitations were sent to 21 Greek GPs who had previously agreed to participate (in a questionnaire which was distributed earlier among GPs for the SPIMEU project) from three Health Regions of Greece: The 5th Regional Health Authority of Sterea Ellada and Thessaly (that covers the areas of Thessaly and Central Greece); The 6th Regional Health Authority Peloponnese, Ionian Islands and Western Greece; The 7th Health Region of Crete. We asked them to recruit

30 patients each, to participate in the study. We received positively response from 15 out of 21 GPs.

We sent via mail all printed material (questionnaires along with instructions to mail them back). The amount of remuneration amount per GP was €195 to every GP who participated and completed the 30 questionnaires. We received approval for this study from the bioethics committee of the 7th Health Region of Crete on the 5th of August 2016 (Protocol number: 11138-05/08/2016).

The Netherlands: We invited 20 GPs who had previously agreed to participate (in a questionnaire which was distributed earlier among GPs for the SPIMEU project) to distribute the printed questionnaires among their patients and return at least 30 completed questionnaires to us. At least two reminders were sent to each GP. In the end 11 GPs participated by returning the completed questionnaires. The GP could decide which method to use for distribution of the questionnaires, for example by handing them out during a consultation or put them in the waiting room. Since the exclusion criteria were mentioned on the first page of the questionnaire, patients were able to check themselves whether they were eligible to complete the questionnaire. The GPs received a remuneration of €50 when they returned at least 20 completed questionnaires. The medical ethical committee of the UMC Utrecht provided a declaration of non-WMO research (Protocol number 16/679).

Sweden: Several primary care centres were approached and 6 centres (employing from 5 to 25 doctors each) in the county of Stockholm agreed to participate. Posters inviting patients to participate were posted in waiting rooms and the questionnaires were handed out and collected to eligible patients by the receptions. The inclusion was slow at first, but we hired a student that approached the patients and asked if they wanted to participate, which helped increase participation. Both rural and urban primary care centres were included in the study. Ethical approval was obtained from the regional ethics board in Stockholm (Protocol number 2016/2190-32).

Supplementary file 2. Description of the available selective prevention programmes for CMD

The Czech Republic: A nation-wide selective prevention programme has been implemented which includes a biannual invitation for a GP visit to all persons from 18 years and older to systematically check for CMD risk¹. GPs are paid fee-for-service to provide these health checks by health insurance funds, so they are free of charge for the patients.

The Netherlands: A national guideline developed by the NHG for a stepwise selective prevention programme for CMD is available. This 'prevention consultation cardiometabolic risk module'², is a stepwise programme which consists of an initial risk assessment for all persons without any known risk factor for CMD between 45-70 year old through a questionnaire (for example via internet). Based on this risk assessment, persons with increased risk are invited to visit the GPs practice for further, more extensive risk assessment and tailored interventions if necessary. However, the first step is not yet reimbursed and currently discussion is going on about who is responsible for this risk assessment³.

Sweden: No national programme exists, but local efforts exist. For example; since 1985 the Västerbotten intervention programme has been integrated in one county in primary care. In this programme all persons at ages 40, 50 and 60 years are invited to participate in a systematic risk factor screening and individual counselling of healthy lifestyle habits. The program is funded by regional taxes and primary care centres are paid 650 SEK (€62) for each completed health survey within the programme⁴.

Supplementary file 3. Factors associated with unwillingness to participate in a health check per country

OR (95% CI)	Age 55 and younger	Male	Low, middle education ^a	Not (self) employed ^b	Living alone ^c	BMI 25 and higher ^d	Currently Smoking ^e	High physical Activity ^f	No family history of CVD / DM II ^g	Good self rated health ^h
the Czech Republic	0.87 (0.32-2.39)	3.13 (1.38-7.11)	0.93 (0.43-2.01)	1.63 (0.66-3.98)	1.99 (0.84-4.72)	0.75 (0.34-1.69)	1.68 (0.71-3.98)	1.46 (0.65-3.27)	2.89 (1.15-7.30)	2.05 (0.92-4.55)
Denmark	0.61 (0.15-2.54)	2.31 (0.60-8.89)	1.46 (0.41-5.22)	0.65 (0.13-3.15)	0.51 (0.06-4.13)	1.17 (0.33-4.18)	3.27 (0.87-12.27)	6.78 (1.81-25.36)	2.25 (0.46-10.90)	4.05 (0.84-19.58)
Greece	0.88 (0.36-2.12)	1.02 (0.54-1.95)	1.38 (0.72-2.64)	1.90 (0.99-3.64)	1.24 (0.57-2.68)	1.22 (0.62-2.42)	2.02 (1.05-3.88)	0.93 (0.37-2.34)	1.21 (0.63-2.32)	1.11 (0.58-2.11)
the Netherlands	7.99 (1.06-60.54)	1.10 (0.47-2.61)	1.06 (0.38-2.99)	0.69 (0.28-1.72)	1.47 (0.47-4.63)	0.99 (0.42-2.31)	0.95 (0.31-2.94)	0.65 (0.25-1.70)	1.05 (0.46-2.42)	2.00 (0.86-4.65)
Sweden	0.69 (0.23-2.05)	0.85 (0.27-2.71)	1.12 (0.40-3.16)	1.11 (0.39-3.14)	2.03 (0.66-6.23)	4.79 (1.49-15.43)	0.78 (0.10-6.30)	1.50 (0.46-4.90)	0.97 (0.36-2.67)	0.79 (0.29-2.16)
Total	1.15 (0.71-1.88)	1.48 (1.02-2.14)	1.10 (0.75-1.61)	1.39 (0.94-2.05)	1.47 (0.94-2.30)	1.35 (0.92-1.97)	1.88 (1.25-2.82)	1.19 (0.78-1.83)	1.36 (0.92-2.00)	1.51 (1.04-2.20)

OR: Odds Ratio, 95%CI: 95% confidence interval. Grey numbers: n ≤ 3 per cell

a Low: No education, primary school, middle: Secondary school/high-school, high: Vocational training, University

b Not (self) employed includes looking for work, not working because of poor health, fulltime house person or being retired, or being a student or other

c Living together: living with partner, children and/or parents

d BMI: Body mass index

e Smoking: At least one cigarette per day

f High physical activity: ≥5 days/week ≥30 min

g CVD: Cardiovascular disease, onset before the age of 60, DM II: type 2 diabetes mellitus

h Scale from 1-10, 1 very bad health 10 very good health

Supplementary references

1. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.
2. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
3. de Wit N, Hollander M, Schellevis F. Preventie hart- en vaatziekten is los zand. 2016; Available at: <https://www.medischcontact.nl/nieuws/laatste-nieuws/artikel/preventie-hart-en-vaatziekten-is-los-zand.htm>. Accessed 08/16, 2017.
4. Norberg M, Wall S, Boman K, Weinehall L. The Vasterbotten Intervention Programme: background, design and implications. *Glob Health Action* 2010 Mar 22;3:10.3402/gha.v3i0.4643.



Chapter 7

Barriers and facilitators to participation in a health check for cardiometabolic diseases in primary care: A systematic review

Anne-Karien M de Waard, Per E Wändell, Martin J Holzmann, Joke C Korevaar, Monika Hollander, Carl Gornitzki, Niek J de Wit, François G Schellevis, Christos Lionis, Jens Søndergaard, Bohumil Seifert and Axel C Carlsson; on behalf of the SPIMEU Research Group.



Abstract

Background: Health checks for cardiometabolic diseases could play a role in the identification of persons at high risk for disease. To improve the uptake of these health checks in primary care, we need to know what barriers and facilitators determine participation.

Methods: We used an iterative search strategy consisting of three steps: (a) Identification of key-articles; (b) Systematic literature search in PubMed, Medline and Embase based on keywords; (c) screening of titles and abstracts and subsequently full-text screening. We summarised the results into four categories: characteristics, attitudes, practical reasons and healthcare provider-related factors.

Results: Thirty-nine studies were included. Attitudes such as wanting to know of cardiometabolic risk, feeling responsible for, and concerns about one's own health were facilitators for participation. Younger age, smoking, low education and attitudes such as not wanting to know, or being worried about the outcome, low perceived severity or susceptibility and negative attitude towards health checks or prevention in general were barriers. Furthermore, practical issues such as information and the ease of access to appointments could influence participation.

Conclusion: Barriers and facilitators to participation in health checks for cardiometabolic diseases were heterogeneous. Hence, it is not possible to develop a 'one size fits all' approach to maximise the uptake. For optimal implementation we suggest a multifactorial approach adapted to the national context with special attention to people who might be more difficult to reach. Increasing the uptake of health checks could contribute to identifying the people at risk to be able to start preventive interventions.

Introduction

Cardiometabolic diseases (CMDs) including cardiovascular disease (CVD), diabetes and chronic kidney disease remain the number one cause of death worldwide.¹ To a large extent, CMDs are caused by an unhealthy lifestyle, with smoking, unhealthy diet and physical inactivity as the most important risk factors.²⁻⁵ With the increasing rates of obesity and insufficient physical activity,⁶ in combination with smoking and the ageing population,⁷ there is an urgent need for stimulating CMD prevention programmes. Studies have shown that as much as 80% of CVD could be prevented or postponed if risk factors in lifestyle and behaviour could be eliminated.⁸ To be able to do this, it is necessary to find the people with risk factors in lifestyle and behaviour. Selective prevention,⁹ defined as the identification of people at high risk for CMD among those without established CMD, combined with interventions to help prevent or delay the onset of disease therefore represents a good starting point for CMD prevention.

The first step of selective prevention, CMD risk assessment, can be done by a health check. This health check could be organised in several ways, such as a questionnaire that can be completed on the Internet or a more detailed health check performed by a doctor and with (laboratory) tests. On the one hand, health checks have not been shown to be effective to reduce mortality¹⁰ and screening and lifestyle counselling in the general population has been shown to have no effect on the development of ischaemic heart disease.¹¹ On the other hand, it has been shown that health checks in primary care led to an improvement in surrogate outcomes such as total cholesterol, blood pressure and body mass index (BMI)¹² and a health check followed by tailored lifestyle advice led to both increased physical activity and healthier eating habits.¹³ Furthermore, improved control of modifiable risk factors in primary care, in patients with multiple risk factors, was shown to decrease cardiovascular events.¹⁴

The European Society of Cardiology (ESC) guideline on CVD prevention (2016) recommends performing a health check for CVD risk assessment in men above 40 years and in women above 50 years of age at least every five years.⁸ Given the longstanding and continuous relationship of patients with their general practitioner (GP) and the presence of up to date medical records,¹⁵ GPs have an unique opportunity to identify people at high risk for CMD among people without established CVD, and in assessing their eligibility for intervention.⁸ Different examples of health checks in primary care already exist for example in the United Kingdom (UK),¹⁶ Czech Republic¹⁷ and in the Netherlands.¹⁸ To be able

to assess individuals' eligibility, however, it is important that people participate in health checks. The uptake of health checks in primary care varies widely, with response rates ranging from 1.2% for an online risk estimation¹⁹ to 84.1% for fasting plasma glucose measurement as screening for type 2 diabetes.²⁰ To improve the uptake of health checks for CMD in primary care, we need to know what barriers and facilitators determine participation in health checks.

Primary care seems to be a promising setting for CMD health checks, therefore we will focus on this setting with a broad view on barriers and facilitators including both characteristics and reasons related with participation. So far, reviews did not select on characteristics and reasons related to participation just in primary care but in different settings.^{21,22}

In this study we aim to identify characteristics and barriers and facilitators of people for participation in health checks for CMD in a primary healthcare setting.

Methods

Data collection

We performed a systematic search and review²³ within the framework of the SPIMEU (Determinants of successful implementation of selective prevention of CMD across Europe) project, which is a European Commission co-funded project and aims to identify determinants of successful implementation of selective prevention of CMD in primary care across Europe.²⁴

The purpose of this review was explorative and aimed to provide a broad overview of barriers and facilitators for participation in health checks. Since a broad search, including all synonyms related to this subject, yielded more than 35,000 articles, we decided to apply a three-step method to search for articles using an iterative method described by Zwakman et al.²⁵ As the first step we defined the research question and identified five key articles related to the aim of our review (e.g. about CMD, health checks or barriers and facilitators for participation).²⁶⁻³⁰ Step two consisted of a backward and forward citation search based on these five key articles. The backward citation search identified articles through the reference list of the key articles, and the forward citation search identified articles citing one of the key articles using Google Scholar. This yielded 30 articles (the 'golden bullets') which we used to identify important keywords and index terms to build the search including 'barriers and facilitators', 'health check', 'cardiometabolic diseases', 'primary care' and their synonyms.

Subsequently we used the search string based on the keywords from the golden bullets to search in Medline (Ovid), Embase (embase.com), Cinahl (Ebsco) and PubMed. This search strategy included both free-text and MeSH (Medical Subject Headings) terms, and was initially created in Medline and later adapted to the other databases with corresponding vocabularies. The searches were conducted by two librarians at the University Library at Karolinska Institute in March 2016. We performed a combined search for both barriers and facilitators for professionals and patients. The results concerning the professionals are reported elsewhere.³¹ The complete search strategies are available in Supplementary file 1.

In step three, all titles and abstracts were screened according to the eligibility criteria (see below) by either ACC, MJH or AKW using the screening programme Rayyan.³² Selected articles were assessed for eligibility by at least two authors (PW, AKW, MJH or ACC).

If there was any uncertainty as to whether particular articles should be included or not, they were discussed among the four authors that did the screening to reach a final decision based on the eligibility criteria. Reference lists of included articles were also searched and articles citing the already included studies were identified through Google Scholar searches until no new articles were identified anymore (Figure 1). Selected articles were assessed for inclusion based on full text by at least two authors (PW, AKW, MJH or ACC).

Eligibility criteria

We used the following eligibility criteria:

- Thematic focus on prevention of cardiometabolic diseases.
- Regarding adult people (18+) without established CMD, so all studies performed only in patients already diagnosed with cardiovascular disease (or taking medication for hypertension or dyslipidaemia), diabetes mellitus or chronic renal failure were excluded.
- Performed in a primary care setting.
- Data on barriers and facilitators to (not) participate in a health check.
- Health check that started with an invitation for a health check for CMD (not hypothetical willingness to participate or intention to attend).
- Original research (no opinion papers such as editorials).
- Language: English, Swedish, German or Dutch.

We defined a health check as the first step in a prevention programme: inviting people for a risk assessment to identify people at high risk. A health check could be part of a prevention programme, which, according to our definition, also includes the next step: interventions to decrease the risk in people who are identified in the health check as being at increased risk. In this current review, we only included information on barriers and facilitators to participate in the health check if possible. If information was given only about the whole prevention programme including the intervention then we used this information.

Assessment of study quality

Our review has an explorative nature and the intervention and outcome are heterogeneous. Furthermore, the research question can be answered using different study designs; quantitative, qualitative and mixed-methods studies could give insight in barriers and facilitators for participation. To our knowledge, no specific quality assessment instrument is available for this type or review. Therefore, we decided to limit the quality assessment to two criteria: (a) adequate number of participants: at least 100 participants and (b) control group comparison: studies directly comparing participants with non-participants. We used these criteria separately to see whether the identified barriers and facilitators changed when only good quality studies were considered compared to all studies.

Data analysis

Data extraction from the articles was performed by AKW. The identified papers included were heterogeneous in design (qualitative and quantitative), in population (from different contexts) and in facilitators and barriers described. We therefore decided to use a more narrative synthesis approach which has been used in previous research.^{21,22}

To structure the data we divided the results into four different themes: (a) personal characteristics; (b) attitude towards the outcome of health checks and prevention in general; (c) practical issues; and (d) barriers and facilitators for people related with the healthcare provider. Part of this structure was derived from the study of Burgess et al.³³ and adapted based on the results from the articles included in our review.

We then categorised factors into (a) barriers; (b) facilitators; or (c) neutral, the latter meaning that the factor was studied, but was not identified in the study

as a barrier or facilitator. To target the most commonly reported findings in the articles, we decided to pay attention in the text to factors only reported in more than 10 articles and which were identified as a barrier or facilitator in at least two-thirds (67%) of these articles.

Since the studies reported their findings in a different manner, we used the following criteria to be able to report the results in this review in a uniform way. In the studies with a direct comparison between participants and non-participants, factors which significantly differed between these groups were included in the tables. If a multivariable analysis was performed then the results of this analysis were used. If no significance level was reported, we included the factors with an absolute difference between the group of attenders and non-attenders of 5% or more. If this was not reached, we described the factor as neutral. In studies which only described one group, either participants or non-participants, the factors which were indicated as facilitators or barriers in 5% or more of the studied population were reported. We chose this low percentage because we did not want to miss a potential barrier or facilitator.

Some health checks consisted of several steps: for example, an online health risk assessment as the first step and a complete risk assessment as the second step.²⁰ We chose to report the barriers and facilitators for both these steps, since they are both part of the health check.

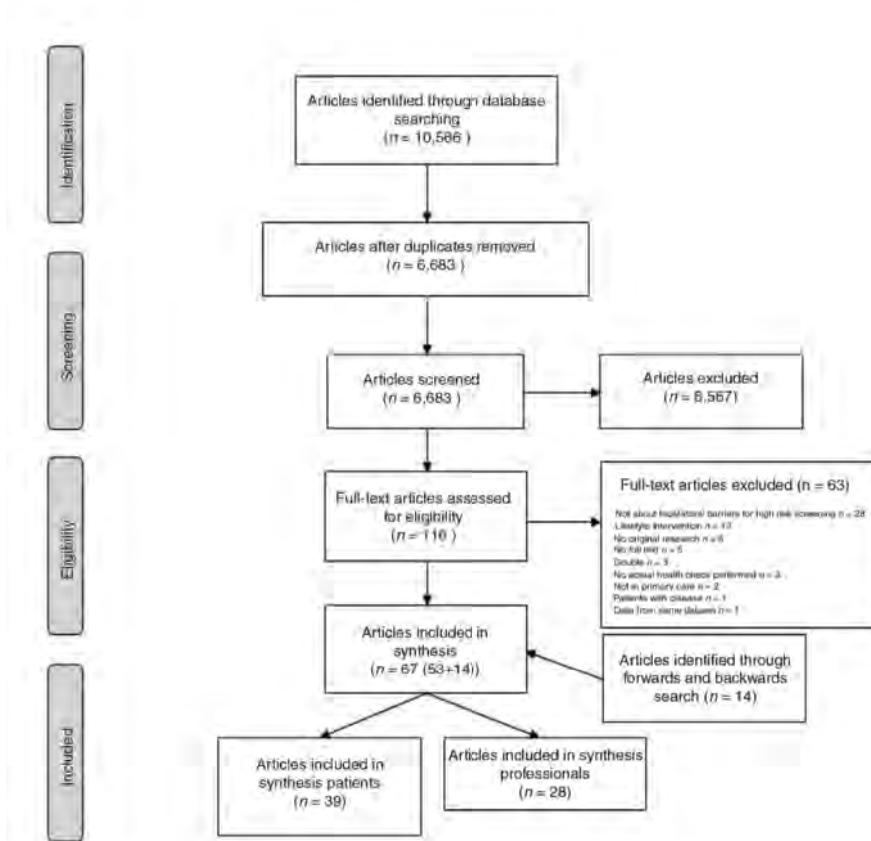
Results

Study selection and study characteristics

In total, the search identified 6683 unique articles of which titles and abstracts were screened. After screening for eligibility and quality, 40 articles remained. Two articles described the results based on the same dataset.^{34,35} We included only one of the two studies³⁴ which directly compared non-attenders with attenders. The flowchart is shown in Figure 1 and the characteristics of the 39 included studies are summarised in Tables 1-3. The included articles were published between 1988-2016. Twenty-six studies (67%) were conducted in the United Kingdom (UK), of which 10 reported barriers and facilitators about the National Health Service (NHS) health check, which is a health check for people aged 40-74 years in the UK.¹⁶ The other studies were from the Netherlands (five), Denmark (three), Sweden (three), China (one) and Germany (one).

Almost all studies included people in the age range between 30-75 years, except for one study from the Netherlands which focused on elderly people

Figure 1. Flow-chart of studies



between 76-82 years of age.³⁶ Attendance rates for health checks ranged from 1.2%¹⁹ to 84.1%.²⁰ Quantitative methods for data collection were used in 27 studies, (e.g. questionnaire and registry data), qualitative methods were used in 11 studies (e.g. focus groups and semi-structured interviews) and one study used both quantitative and qualitative methods for data collection.

Barriers and facilitators

The factors related to participation (facilitators), non-participation (barriers) and neutral factors are summarised in Figure 2, more detailed results can be found in Supplementary files 2(a) and (b).

Personal characteristics. Socio-economic status (SES), age, social life, smoking status, and receiving medical care were studied more than 10 times and were reported in at least two-thirds of the studies as a barrier or facilitator (Figure 2). In total, 22 (56%) of the studies reported about SES, of which 16 (73%) reported it as a barrier or facilitator (Figure 2). Different characteristics were classified as SES: educational level, occupation, income level and ownership of a house or car. Low educational level was reported as a barrier in one study³⁷ and middle or higher educational level was a facilitator in two studies.^{37,38} However in eight studies education was neither a facilitator nor a barrier.^{19,20,39-44} Overall, low SES was reported to be both a barrier and a facilitator,^{45,46} and higher SES to be a facilitator.⁴⁷

In total, 18 studies (46%) reported about age, of which 12 (67%) reported it as a barrier or facilitator. Higher age was a barrier in one study,³⁹ a facilitator in six studies,^{20,44,48-51} and lower age was a barrier in four studies.^{37,42,50,52} In six studies age was neither barrier nor facilitator (Supplementary file 2).^{19,38,40,41,53,54} Smoking status was reported in 14 studies (36%), of which 10 (71%) reported it as barrier or facilitator. Smoking was a barrier for participation and not smoking a facilitator in ten studies.^{20,40,41,43,47-49,55-57} Smoking was a neutral factor in five studies.^{19,39,50,54,55}

Receiving medical care was a barrier or facilitator in 11 out of 12 studies (92%). Being under medical care or being recently examined were reported as a barrier for participation in six studies.^{39,43,44,58-61} In contrast, frequently consulting a doctor was described as a facilitator in four studies^{38,40,47,48,62} and as a neutral factor in one study.¹⁹

Factors related to social life were a barrier or facilitator in nine out of 12 studies (36%). Being single, unmarried or being responsible for a young child (<5 years) or other dependants were reported as barriers in four studies.^{37,40,41,58} Being married or cohabitating, having no responsibility for young children or dependants and strong social support were reported as facilitators^{20,34,38,47,48}.

Attitudes. Attitude towards the outcome of the health check, the feeling of being responsible for one's own health, perceived severity and susceptibility, and attitudes towards prevention in general were studied more than 10 times and were reported in at least two-thirds of the studies as a barrier or facilitator. Perceived severity was defined as 'an individual's belief about the seriousness of the threat' and perceived susceptibility as 'individual's beliefs about his or her chances of experiencing the threat'⁶³.

In total 18 studies (46%) reported about the attitude towards the outcome of the health check. Barriers were not wanting to know CMD risk^{19,33,59} and being worried about the outcome of the check and its possible consequences.^{39,58-61} On the other hand, wanting to know CMD risk,⁴⁵ wanting to be reassured,^{29,33,36,58,61,64,65} and not having fear for the outcome^{36,58} were facilitators.

In total 14 studies (36%) reported about feelings of responsibility towards one's own health. Facilitators for participation were: feeling responsible for one's own health, finding health important or believing to be able to influence one's health status.^{29,34,38,40,45,66} Factors related with susceptibility and severity of disease were reported in 13 studies (33%). Barriers for participation were experiencing less severity or susceptibility of disease or feeling healthy,^{33,39,43,58-60,67-69} whereas concerns about health were facilitating for participation.⁶⁴ The attitude of people towards prevention or towards health checks was reported in 12 studies (31%). In general a negative attitude towards prevention or health checks was a barrier for participation,^{45,54,59} whereas a positive attitude was a facilitator^{33,60,65,66,70} or a neutral factor.⁵⁴

Practical reasons. The practical reasons that were studied more than 10 times and reported as barrier or facilitator in at least two-thirds of the studies were: the kind of invitation and information provision, time constraints and appointment related issues.

In total, 17 studies (44%) described factors related with the kind of invitation and information for a health check of which 14 (82%) described this as a barrier or facilitator. Not receiving the invitation^{38,39,61,67,68} and not being familiar with the health check^{19,33} were identified as barriers. Clear information about the health check^{29,67} an invitation by the GP or health centre^{36,68} and additional effort for invitation such as an additional phone call after the invitation⁴⁵ or the use of outreach workers⁶⁷ were identified as facilitators.

A barrier was lack of time, including being busy with, for example, work or family.^{19,33,43,45,58-61,67,69} Being retired and working flexible hours were identified as facilitators in one study.³³ Difficulties with arranging the appointment, for example no time slot available outside working hours.⁶⁰ were identified as barriers, whereas health checks with no appointment needed and easy access were identified as facilitators.^{62,67,68}

Healthcare provider- related factors. Barriers and facilitators for people related to their healthcare provider were not often described. All factors within this category, such as experience with the GP (five studies) and practice

characteristics (four studies), were described less than 10 times, so less often than the minimum number we reported on.

Quality assessment

In total 28 articles (72%) reported results based on studies with more than 100 participants. These studies were all quantitative studies. Focus on these studies alone did not change the results within the category of personal characteristics and factors that were identified both as barriers and facilitators were comparable. Attitudes and practical issues were less often described in the studies with more than 100 participants. In total, 26 studies (67%) directly compared participants and non-participants. These studies were mostly quantitative studies and only including these studies did not change the results within the of category personal characteristics. Attitudes and practical issues were less often described in studies with direct comparison of participants and non-participants. In Figure 2 and Supplementary file 2(a), the studies that were still included after applying both the quality criteria are shown in darker colours (Figure 2) and in bold (Supplementary file 2(a)).

Table 1. Characteristics of studies describing attenders of health checks of cardiometabolic diseases in primary care

Year	First author	Country, programme	Number of Participants (P)	Inclusion (in) and exclusion (ex) criteria	Method
⁶² 1991	Norman	UK	P: 159	In: Age 30-50	Questionnaire about views health check and way of invitation Semi-structured interview (n=11)
⁴⁶ 1994	Ochera	UK	P: 1,712	In: Age 30-65, part had health check < 12 months, part randomly selected Ex: Patients who had moved or died	Registry data and Questionnaire
⁶⁷ 2010	Harkins	UK, HaHP	P: 13	In: age 45-60, Registered with a GP, Socio-economically disadvantaged people who attended follow-up after 6 months Ex: History of heart disease	Focus group discussions
⁷⁰ 2012	Hardy	UK, PhyHWell	P: 5	In: Age: 25, 47, 48, 52, 76 Severe mental illness (Bipolar disorder, Schizophrenia)	Interview
⁶⁴ 2014	Baker	UK, NHS health check	P: 1,011	In: Age 40-74	Survey with quantitative and qualitative (open-ended) questions
²⁹ 2015	Ismail	UK, NHS health check	P: 45 baseline, 38 follow-up	In: Age 40-74	Semi-structured qualitative interviews + 1 year follow up interview
³⁶ 2015	Ligthart	The Netherlands, pre-DIVA trial	P: 15	In: Age 76-82 Ex: Dementia or conditions likely to hinder successful follow-up	Semi-structured interviews

Table 1. Continued

Year	First author	Country, programme	Number of Participants (P)	Inclusion (in) and exclusion (ex) criteria	Method
⁶⁵ 2015	Riley	UK, NHS health check	P: 28	In: Age 40-74 Patients who attended < 6 months Ex: Existing CVD	Semi-structured Interviews
⁶⁸ 2014	Zhong	China, Dutch-Chinese prevention consultation	Unknown	In: Age >35	Questionnaire
⁴⁹ 2016	Robson	UK, NHS health check	P: 214295 (2009-2012)	In: Age 40-74 Ex: Pre-existing vascular disease	Registry data

CVD: cardiovascular disease; GP: general practitioner; HaHP: Have a Heart Paisley; NHS: National Health Service; pre-DIVA: prevention of dementia by intensive vascular care; UK: United Kingdom

Table 2. Characteristics of studies describing non-attenders of health checks of cardiometabolic diseases in primary care

Year	First author	Country, program	Number of Non-participants (NP)	Inclusion (in) and exclusion (ex) criteria	Method
⁵⁸ 1988	Pill (The views)	UK	NP: 259	In: Age 20-45	Semi-structured interview
⁵⁹ 2004 1991	Nielsen study	Denmark	NP: 18	In: Age 30-50	Guided qualitative interview
⁶⁰ 2015	Ellis	UK, NHS health check	NP: 41	In: Age 40-74	Semi-structured interviews

NHS: National Health Service; NP: Non-participants; UK: United Kingdom

Table 3. Characteristics of studies describing attenders compared to non-attenders of health checks of cardiometabolic diseases in primary care

Year	First author	Country, program	Number of Participants (P), non-participants (NP)	Inclusion (in) and exclusion (ex) criteria	Method
³⁸ 1988	Pill (comparison)	UK	P: 216 NP: 259	In: Age 20-45	Questionnaire using semi-structured interview
⁴⁸ 1990	Waller	UK	P: 963 NP: 495	In: Age 35-64	Medical record audit and questionnaire
³⁹ 1993	Jones	UK	P: 2,402 NP: 98	In: Age 25-55, patients with and without a history of CHD.	Questionnaire and health data
⁶⁶ 1993	Norman	UK	P/NP: 150	In: Middle aged	Health belief questionnaires before invitation
⁴⁰ 1993	Thorogood	UK	P: 2,205 NP: 473	In: Age 35-64, also patients with angina and MI included	Postal health belief questionnaire before invitation to health check
⁵⁵ 1994	Davies	UK British family heart study	P: 2,315 NP: 141	Age 40-59	Questionnaire
⁴¹ 1994	Griffiths	UK	P: 113 NP: 137	In: Age >16	Questionnaire
³⁴ 1995	Christensen	Denmark	P: 1,272 NP: 423	In: Age 40-49, men	Questionnaire
⁴² 1997	Weinehall	Sweden, Västerbotten program	P: 14,188 NP: 10,682	In: Age 30, 40, 50 or 60	Registry data
⁴³ 2004	Wall	Sweden, Ockelbo project	P: 237 NP: 67	In: Age 35 or 40	Questionnaire or telephone interview (with non responders questionnaire)
⁴⁴ 2009	Dalsgaard	Denmark, ADDITION study	P: 879 NP: 1,100	In: Age 40-69 with high-risk score Ex: known diabetes	Questionnaire + Registry data

Table 3. Continued

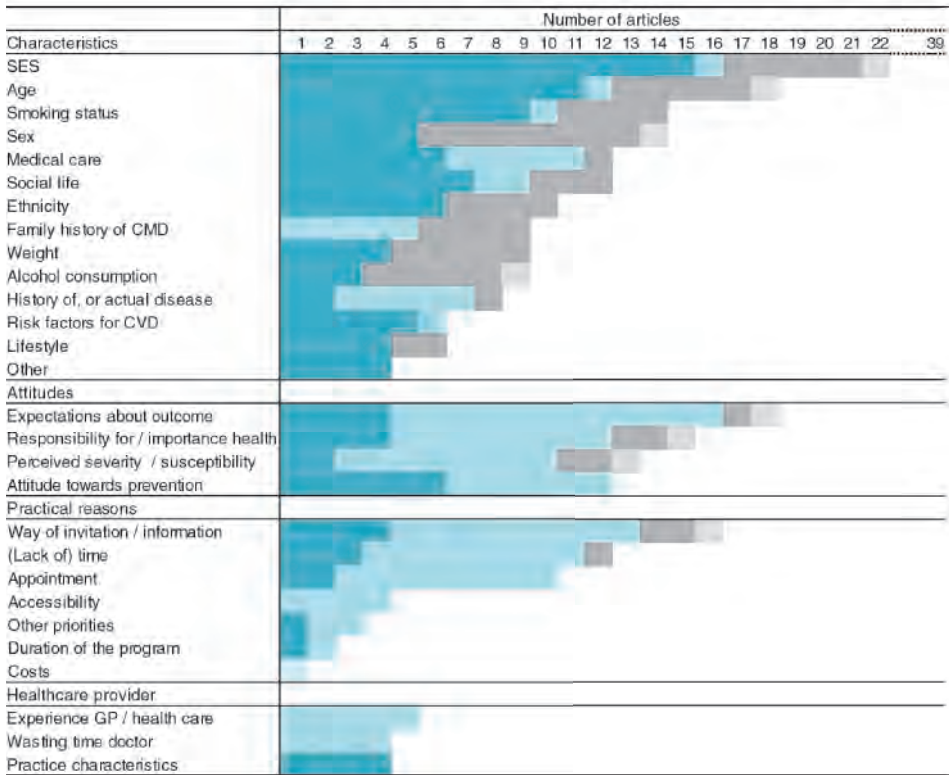
Year	First author	Country, program	Number of Participants (P), non-participants (NP)	Inclusion (in) and exclusion (ex) criteria	Method
⁵² 2010	Marteau	UK, DICISSION trial	P: 721 NP: 551	In: Age 40–69, at risk for diabetes (risk score practice registers). Many were obese or used anti-hypertensive drugs Ex: known diabetes	Questionnaire (willingness to change lifestyle)
⁵⁰ 2011	Dalton	UK, NHS health check	P: 2,370 NP: 2,924	In: Age 35–74 with >20% 10-year risk on CVD (GP records) incl. people with hypertension or using statins Ex: CVD (CHD, stroke/TIA) or diabetes	Electronic medical record
⁶⁹ 2012	Eborall	UK, MY-WAIST	P: 13 NP: 84	In: Age 40–70 (30–70 South Asian & African-Caribbean origin)	Semi-structured interviews or reply slip with open-ended questions
²⁰ 2012	Klijs	The Netherlands	P: 4,457 NP: 848	In: Age 40–74, self-measured waist circumference ≥ 80 cm (women) ≥ 84 cm (men) Ex: Known diabetes	Registry data
⁵⁶ 2011	Lambert	UK, deadly trio-programme	P: 5,871 NP: 18,295	In: Age >40, men from Birmingham inner city Ex: Already in a disease register	Routine data
³⁷ 2012	Norberg	Sweden, Västerbotten	P: 96,560 observations NP: 61,622 observations	In: 40th, 50th, and 60th birthdays, all inhabitants	Registry data
¹⁹ 2013	Van der Meer	The Netherlands	P: 617 NP: 142	In: Age 45–70	Registry data, questionnaire
³³ 2014	Burgess	UK, NHS health check	P: 17 NP: 10	In: Age 40–74, invited for NHS health check Ex: Already in care-path, did not receive invitation for health check	Semi-structured interviews

Table 3. *Continued*

Year	First author	Country, program	Number of Participants (P), non-participants (NP)	Inclusion (in) and exclusion (ex) criteria	Method
⁴⁷ 2014	Hoebel	Germany, GEDA study	P: 13,328 NP: 13,227	In: Age > 35, respondents with statutory health insurance	GEDA (German health update) = national telephone health interview survey
⁵¹ 2015	Attwood	UK, NHS	P: 373 NP: 1,007	In: Age 40-74	Registry data
⁵³ 2015	Groenenberg (Response)	The Netherlands	Step 1 HRA P: 308 NP: 440 Step 2 Prev. c. P: 123 NP: 84	In: Age 45-70 (35 for Hindustani and Surinamese)	Electronic medical record
⁶¹ 2015	Jenkinson	UK, NHS health check	P: 17, NP: 10	In: Age 40-74, invited for NHS health check	Semi-structured interviews
⁵⁴ 2014	Krska	UK, NHS health check	P: 434, NP: 210	In: Age 40-74, people with estimated risk on CVD >20% from medical records	Cross-sectional postal survey
⁴⁵ 2016	Groenenberg (Determinants)	The Netherlands	HRA P: 696, NP: 196	In: Age 45-70 and low SES	Questionnaire
⁵⁷ 2016	Lang	UK	P: 2,339 NP: 3,127	In: Age 50-74, No CVD diagnosis	Primary care electronic health records

CHD, Coronary heart disease; CVD, Cardiovascular disease; GEDA: German Health Update; HRA, Health risk assessment; MI, Myocardial infarction; NHS, National health service; NP, Non-participants; P, Participants; PC, Primary care; Prev. C., prevention consultation (consultation in the practice); SES: Socio-economic status; TIA: Transient ischemic attack; UK, United Kingdom

Figure 2. Barriers and facilitators for people to participate in a health check for CMD



Legend

- Barrier or facilitator
- Barrier or facilitator: Less than 100 participants and/or only attenders or non-attenders
- Neutral
- Neutral: Less than 100 participants and/or only attenders or non-attenders

CMD, cardiometabolic disease; CVD, cardiovascular disease; GP, general practitioner; SES, socioeconomic status

Discussion

Summary of the results

Barriers and facilitators for people to participate or not in health checks for CMD in primary care are heterogeneous. Lower age, lower education, smoking and living alone seemed to be barriers for participation but the results were not univocal. Wanting to know one's CMD risk (reassurance), feeling responsible for one's own health and concerns about health were facilitators for participation, whereas not wanting to know the risk, being worried about the outcome, feeling healthy or low perceived severity or susceptibility of disease were barriers. Furthermore, practical issues for people to participate, such as the kind of invitation to the health check, providing sufficient information, requested time investment for the participants and possibilities for easy appointment play an important role in the acceptance. Overall, we conclude that for a good uptake of health checks, a multifactorial approach is necessary.

Discussion in the light of the literature

The characteristics and reasons to (or not to) participate in CVD health checks in different settings were previously explored in two reviews.^{21,22} Dryden et al. identified several characteristics and attitudes of people that were related to non-participation. Non-participants were, for example, more often men, had a lower income or SES, were younger, single, smokers and had more cardiovascular risk factors. Furthermore, they felt less in control over their health, valued health less strongly and were less likely to believe in the efficacy of health checks.²¹

Stol et al. focused more on the reasons for participation in cardiovascular health checks. They identified a broad range of reasons for participation, which were related to health improvement, for example, wanting to know health status, health monitoring, for example, reassurance and practical issues such as a convenient location with wide opening times. On the other hand, they also identified reasons for non-participation which were also related to health improvement, for example, feeling healthy and considering risk as low. Furthermore, having no faith in screening, and not wanting to know the outcome of the health check, practical issues such as lack of time and lack of knowledge and poor accessibility were reasons for non-participation. The reasons for (non-) participation were comparable to our findings which could be partly due to some overlap of the included articles (11/39 overlapping articles), although our study was focused on primary care;

We expected that we would be able to find personal characteristics that would be specific for participation in a health check for CMD. From the literature we know that people with the largest need for medical care, are the least likely to receive it, which is known as the 'inverse care law'.⁷¹ Furthermore, women receive less satisfactory preventative management than men, especially when the GP is a man.⁷² Also people with a lower SES are less likely to receive preventive care.⁷³ This was confirmed by the review of Dryden et al.: the people at higher risk for CVD were less likely to participate in a health check²¹ and health checks are more likely to serve the 'worried well'. Our review did partly confirm these results. Smoking, lower education and a higher age seemed to hamper participation. However, these factors were not unanimously identified as barriers.

Given the longstanding and continuous relationship of patients with their GP and the presence of up to date medical records,¹⁵ GPs have a unique opportunity to identify people at high risk for CMD among people without established CVD, and to assess their eligibility for intervention.⁸ Therefore our review focused on health checks performed in primary care. In practice, however, it is not necessarily the GP him/herself that performs all tasks in the health check. For example, in the Västerbotten programme people were invited to their primary healthcare centre, but the district nurse played a crucial role in the actual execution of the tasks in the health check.³⁷ Also in the NHS Health Check the programme is largely delivered by nurses.⁷⁴

Strengths and limitations

A strength of our study is that we were able to identify multiple articles on the subject using a rigorous search, including a backward and forward citation search until no further studies were identified. We believe that this scrutiny was sufficient and that no relevant articles were missed. Furthermore, we were able to collect multiple articles regarding health checks focused specifically on the situation in primary care and general practice. This review gives a broad overview of different categories of barriers and facilitators for participation, including a clear overview about the factors that have been studied and have been most frequently identified as a facilitator or a barrier.

The studies that we included in this review were very heterogeneous as well as the outcome measure 'barriers and facilitators'. We ended up with a broad range of results which were difficult to quantify, count or summarise. Therefore, we decided to only report the factors that were studied more than

10 times and reported barriers or facilitators in more than two-thirds of the studies. Furthermore, we decided to include factors that were significant, or if no significance level was reported, we included the factors with an absolute difference between the group of attenders and non-attenders of 5% or more. We do realise that this is not optimal, since significance also relates to the power of the study, and not merely with the strength of the effect. However, in this way we were able to use a consistent method for data extraction from the mix of qualitative and quantitative studies that we included in the review. These were both pragmatic decisions, and other options for reporting could also be considered. However, since the results were diverse and we did not find factors that were consistently identified as a barrier or a facilitator, we expect that the results will not change drastically when other methods for describing the results would have been applied.

Our review had a descriptive aim, which was to provide an overview about barriers and facilitators. Therefore we did not want to narrow down the described intervention and outcome, as is usually done in systematic reviews, for example when using a PICO (Patient, Intervention, Comparison, Outcome) method to describe a study. Methodologically, we were not able to find a validated instrument to assess the risk of bias or study quality for the studies included in this review. As we have noted, the studies were very heterogeneous and each study reported multiple outcomes in both quantitative and qualitative ways. We applied two criteria to the studies which, in our view, selected the studies with more robust results. We acknowledge that individual studies that we included have several types of bias, and that the bias of each included study might influence the validity of reported barriers and facilitators. However, we believe that if a barrier or facilitator is frequently reported, and reported in studies which included more participants, the likelihood of it being valid is greater.

Most of the studies in our review (26 out of 39 studies in total) were from the UK. In the UK, the GP has a strong position in the healthcare system, including a gatekeeper role.⁷⁵ The other studies were mainly from the Netherlands, and Denmark in which the GP also has a strong position, and primary healthcare is mostly reimbursed for the patient. One study from Denmark showed that the attendance rate for a health check was much higher when it was offered for free compared with costs of around US\$40.³⁵ Overall, costs did not seem to be an important barrier for participation in the studies included in this review, which

may be due to the fact that most studies reported on the NHS Health Check, which is fully reimbursed by the government for the patient.

Three studies were conducted in Sweden, where the GP has a somewhat weaker position. Therefore, our results may not be generalisable to other, especially non-Western countries with different (primary) healthcare systems and a less strong position of the GP. Furthermore, it may be less generalisable to countries where people have to pay for the health check, however based on our review it is not possible to draw firm conclusions about this.

Clinical impact of this study

The overview of barriers and facilitators in this systematic review could be used for future development of selective prevention programmes for CMD in primary care. To improve uptake attention could be paid to different aspects, as described in this review such as personal characteristics, attitude and practical aspects. First of all, special attention could be paid to people who are less motivated to participate, such as smokers, younger people and people with a lower level of education. Secondly, uptake of health checks might be improved by providing good information to the people about the aims and benefits of the health check, and making them aware of their possible risk to develop disease. Third the organisation of the health check could be performed in such a way that makes it as easy as possible for people to participate. For example, a clear invitation that actually reaches the people, a location that is easy to reach and easy access to appointments. By improving the uptake for health checks, especially the people at high risk, interventions could be started to decrease their risk.

Since healthcare systems differ between countries, and the organisation of health checks such as inviting people usually takes place on a local level, we suggest the adaptation of the planning of the health check to the national situation and the actual implementation to the local situation.

Conclusion

The barriers and facilitators for people to participate in health checks for CMD are very heterogeneous. Hence, it is not possible to develop a 'one size fits all' approach for CMD health checks. Personal characteristics, practical reasons and attitudes of people towards prevention and health checks should be taken into account to improve uptake of health checks for CMD in primary care. For the development and implementation of CMD health checks, we suggest a

multifactorial approach and take into account both the national and local context. To increase uptake for health checks, special attention should be paid to groups of people that might be harder to reach, such as those with low SES, smokers and people with a negative attitude towards health checks and prevention. Increasing the uptake of health checks could contribute to identifying the people who are at risk for CMD to be able to start interventions to decrease their risk.

SPIMEU project group collaborators

The SPIMEU research group includes: Anne-Karien M de Waard, Per E Wändell, Martin J Holzmann, Joke C Korevaar, Monika Hollander, Niek J de Wit, François G Schellevis, Christos Lionis, Jens Sondergaard, Bohumil Seifert, Axel C Carlsson, Norbert Král, Anders Sonderlund and Agapi Angelaki.

Author contribution

AKW, PW, MJH, JCK, MH and ACC contributed to conception, design, analysis, interpretation and drafting the manuscript. CL, NJW, FGS, JS, BS, NK, AS and AA contributed to conception. CG contributed to the analysis. All authors critically revised the manuscript and gave final approval.

Acknowledgements

The authors would like to thank René Spijker for his contribution to the iterative search method.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship and/or publication of this article: 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).

The content of this review represents the views of the authors only and is their sole responsibility; it can not be considered to reflect the views of the European Commission and/or the Consumers, Health, Agriculture and Food Executive Agency or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

References

1. World Health Organisation (WHO). Cardiovascular diseases. 2016; Available at: <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed 06/15, 2018.
2. James WP. The epidemiology of obesity: the size of the problem. *J Intern Med* 2008 Apr;263(4):336-352.
3. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001 Nov 27;104(22):2746-2753.
4. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010 Jan;87(1):4-14.
5. Deaton C, Froelicher ES, Wu LH, Ho C, Shishani K, Jaarsma T. The global burden of cardiovascular disease. *Eur J Cardiovasc Nurs* 2011 Jul;10 Suppl 2:S5-13.
6. WHO. Obesity and overweight. 2017; Available at: <http://www.who.int/mediacentre/factsheets/fs311/en/>. Accessed 11/08, 2017.
7. WHO. World Population Ageing 1950-2050. 2002; Available at: <http://www.un.org/esa/population/publications/worldageing19502050/>. Accessed 02/24, 2017.
8. Piepoli MF, Hoes AW, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practiceThe 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
9. Mrazek PJ, Haggerty RJ, editors, Committee on Prevention of Mental Disorders. Institute of Medicine. Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research. Division of Biobehavioral Sciences and Mental Disorders. Washington, DC: National Academy Press; 1994.
10. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
11. Jorgensen T, Jacobsen RK, Toft U, Aadahl M, Glumer C, Pisinger C. Effect of screening and lifestyle counselling on incidence of ischaemic heart disease in general population: Inter99 randomised trial. *BMJ* 2014 Jun 9;348:g3617.
12. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.

13. van den Brekel-Dijkstra K, Rengers AH, Niessen MA, de Wit NJ, Kraaijenhagen RA. Personalized prevention approach with use of a web-based cardiovascular risk assessment with tailored lifestyle follow-up in primary care practice--a pilot study. *Eur J Prev Cardiol* 2016 Mar;23(5):544-551.
14. Avanzini F, Marzona I, Baviera M, Barlera S, Milani V, Caimi V, et al. Improving cardiovascular prevention in general practice: Results of a comprehensive personalized strategy in subjects at high risk. *Eur J Prev Cardiol* 2016 Jun;23(9):947-955.
15. WHO regional office for Europe. Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. 2012; Available at: <http://www.euro.who.int/en/publications/abstracts/action-plan-for-implementation-of-the-european-strategy-for-the-prevention-and-control-of-noncommunicable-diseases-20122016>. Accessed 07/04, 2018.
16. NHS Health Check. Available at: <http://www.nhs.uk/Conditions/nhs-health-check/Pages/NHS-Health-Check.aspx>. Accessed 10/03, 2017.
17. Všeobecná zdravotní pojišťovna (general health insurance company). Všeobecná preventivní prohlídka (General preventive surveillance). Available at: <https://www.vzp.cz/pojistenci/prevence/preventivni-prohlidky/vseobecna-preventivni-prohlidka>. Accessed 10/03, 2017.
18. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
19. Van der Meer V, Nielen MM, Drenthen AJ, Van Vliet M, Assendelft WJ, Schellevis FG. Cardiometabolic prevention consultation in the Netherlands: screening uptake and detection of cardiometabolic risk factors and diseases--a pilot study. *BMC Fam Pract* 2013 /;14:29.
20. Klijs B, Otto SJ, Heine RJ, van der Graaf Y, Lous JJ, de Koning HJ. Screening for type 2 diabetes in a high-risk population: study design and feasibility of a population-based randomized controlled trial. *BMC Public Health* 2012 Aug 17;12:671-2458-12-671.
21. Dryden R, Williams B, McCowan C, Themessl-Huber M. What do we know about who does and does not attend general health checks? Findings from a narrative scoping review. *BMC Public Health* 2012;12(1):723.
22. Stol YH, Asscher EC, Schermer MH. Reasons to Participate or not to Participate in Cardiovascular Health Checks: A Review of the Literature. *Public Health Ethics* 2015;9(3):301-311.
23. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal* 2009;26(2):91-108.
24. SPIMEU research team. Website SPIMEU project. 2017; Available at: www.spimeu.org. Accessed 04, 2017.

25. Zwakman M, Verberne LM, Kars MC, Hooft L, van Delden, J. J. M., Spijker R. Introducing Palette: an iterative method for conducting a literature search for a review in palliative care. *BMC Palliat Care* 2018 Jun 2;17(1):82. doi: 10.1186/s12904-018-0335-z.
26. Godefrooij M, Spigt M, van der Minne W, Jurrissen G, Dinant GJ, Knottnerus A. Implementing cardiometabolic health checks in general practice: a qualitative process evaluation. *BMC Fam Pract* 2014 Jul 6;15:132-2296-15-132.
27. 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 Oct 20;16:144-015-0365-z.
28. Naslund GK, Fredrikson M, Hellenius ML, de Faire U. Characteristics of participating and nonparticipating men in a randomized, controlled diet and exercise intervention trial. *Scand J Prim Health Care* 1994 Dec;12(4):249-254.
29. Ismail H, Atkin K. The NHS Health Check programme: insights from a qualitative study of patients. *Health Expect* 2016 Apr;19(2):345-355.
30. Koopmans B, Nielen MM, Schellevis FG, Korevaar JC. Non-participation in population-based disease prevention programs in general practice. *BMC Public Health* 2012 Oct 9;12:856-2458-12-856.
31. Wandell PE, de Waard AM, Holzmann MJ, Gornitzki C, Lionis C, de Wit N, et al. Barriers and facilitators among health professionals in primary care to prevention of cardiometabolic diseases: A systematic review. *Fam Pract* 2018 Jan 29.
32. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan---a web and mobile app for systematic reviews. *Systematic Reviews* 2016;5(1):210.
33. Burgess C, Wright AJ, Forster AS, Dodhia H, Miller J, Fuller F, et al. Influences on individuals' decisions to take up the offer of a health check: a qualitative study. *Health Expect* 2015 Dec;18(6):2437-2448.
34. Christensen B. Characteristics of attenders and non-attenders at health examinations for ischaemic heart disease in general practice. *Scand J Prim Health Care* 1995 Mar;13(1):26-31.
35. Christensen B. Payment and attendance at general practice preventive health examinations. *Fam Med* 1995 Sep;27(8):531-534.
36. Ligthart SA, van den Eerenbeemt KD, Pols J, van Bussel EF, Richard E, Moll van Charante EP. Perspectives of older people engaging in nurse-led cardiovascular prevention programmes: a qualitative study in primary care in the Netherlands. *Br J Gen Pract* 2015 Jan;65(630):e41-8.
37. Norberg M, Blomstedt Y, Lonnberg G, Nystrom L, Stenlund H, Wall S, et al. Community participation and sustainability - evidence over 25 years in the Vasterbotten Intervention Programme. *Glob Health Action* 2012 Jan;5(1):19166.

38. Pill R, French J, Harding K, Stott N. Invitation to attend a health check in a general practice setting: comparison of attenders and non-attenders. *J R Coll Gen Pract* 1988 Feb;38(307):53-56.
39. Jones A, Cronin PA, Bowen M. Comparison of risk factors for coronary heart disease among attenders and non-attenders at a screening programme. *Br J Gen Pract* 1993 Sep;43(374):375-377.
40. Thorogood M, Coulter A, Jones L, Yudkin P, Muir J, Mant D. Factors affecting response to an invitation to attend for a health check. *J Epidemiol Community Health* 1993 Jun;47(3):224-228.
41. Griffiths C, Cooke S, Toon P. Registration health checks: inverse care in the inner city? *Br J Gen Pract* 1994 May;44(382):201-204.
42. Weinehall L, Hallgren CG, Westman G, Janlert U, Wall S. Reduction of selection bias in primary prevention of cardiovascular disease through involvement of primary health care. *Scand J Prim Health Care* 1998 Sep;16(3):171-176.
43. Wall M, Teeland L. Non-participants in a preventive health examination for cardiovascular disease: characteristics, reasons for non-participation, and willingness to participate in the future. *Scand J Prim Health Care* 2004 Dec;22(4):248-251.
44. Dalsgaard E, Lauritzen T, Christiansen T, Mai KS, Borch-Johnsen K, Sandbæk A. Socioeconomic factors related to attendance at a Type 2 diabetes screening programme. *Diabetic Med* 2009;26(5):518-525.
45. Groenenberg I, Crone MR, van Dijk S, Ben Meftah J, Middelkoop BJ, Assendelft WJ, et al. Determinants of participation in a cardiometabolic health check among underserved groups. *Prev Med Rep* 2016 Apr 30;4:33-43.
46. Ochera J, Hilton S, Bland JM, Jones DR, Dowell AC. Patients' experiences of health checks in general practice: a sample survey. *Fam Pract* 1994 Mar;11(1):26-34.
47. Hoebel J, Starker A, Jordan S, Richter M, Lampert T. Determinants of health check attendance in adults: findings from the cross-sectional German Health Update (GEDA) study. *BMC Public Health* 2014 2014;14:913.
48. Waller D, Agass M, Mant D, Coulter A, Fuller A, Jones L. Health checks in general practice: another example of inverse care? *BMJ* 1990 Apr 28;300(6732):1115-1118.
49. Robson J, Dostal I, Sheikh A, Eldridge S, Madurasinghe V, Griffiths C, et al. The NHS Health Check in England: an evaluation of the first 4 years. *BMJ Open* 2016 Jan 13;6(1):e008840-2015-008840.
50. Dalton AR, Bottle A, Okoro C, Majeed A, Millett C. Uptake of the NHS Health Checks programme in a deprived, culturally diverse setting: cross-sectional study. *J Public Health (Oxf)* 2011 Sep;33(3):422-429.

51. Attwood S, Morton K, Sutton S. Exploring equity in uptake of the NHS Health Check and a nested physical activity intervention trial. *J Public Health (Oxf)* 2016 Sep;38(3):560-568.
52. Marteau TM, Mann E, Prevost AT, Vasconcelos JC, Kellar I, Sanderson S, et al. Impact of an informed choice invitation on uptake of screening for diabetes in primary care (DICISION): randomised trial. *BMJ* 2010 May 13;340:c2138.
53. Groenenberg I, Crone MR, van Dijk S, Ben Meftah J, Middelkoop BJ, Assendelft WJ, et al. Response and participation of underserved populations after a three-step invitation strategy for a cardiometabolic health check. *BMC Public Health* 2015 Sep 3;15:854-015-2139-x.
54. Krska J, du Plessis R, Chellaswamy H. Views and experiences of the NHS Health Check provided by general medical practices: cross-sectional survey in high-risk patients. *J Public Health (Oxf)* 2015 Jun;37(2):210-217.
55. Davies G, Pyke S, Kinmonth AL. Effect of non-attenders on the potential of a primary care programme to reduce cardiovascular risk in the population. Family Heart Study Group. *BMJ* 1994 Dec 10;309(6968):1553-1556.
56. Lambert AM, Burden AC, Chambers J, Marshall T, Heart of Birmingham Teaching Primary Care Trust. Cardiovascular screening for men at high risk in Heart of Birmingham Teaching Primary Care Trust: the 'Deadly Trio' programme. *J Public Health (Oxf)* 2012 Mar;34(1):73-82.
57. Lang SJ, Abel GA, Mant J, Mullis R. Impact of socioeconomic deprivation on screening for cardiovascular disease risk in a primary prevention population: a cross-sectional study. *BMJ Open* 2016 Mar 21;6(3):e009984-2015-009984.
58. Pill R, Stott N. Invitation to attend a health check in a general practice setting: the views of a cohort of non-attenders. *J R Coll Gen Pract* 1988 Feb;38(307):57-60.
59. Nielsen KD, Dyhr L, Lauritzen T, Malterud K. You can't prevent everything anyway: a qualitative study of beliefs and attitudes about refusing health screening in general practice. *Fam Pract* 2004 Feb;21(1):28-32.
60. Ellis N, Gidlow C, Cowap L, Randall J, Iqbal Z, Kumar J. A qualitative investigation of non-response in NHS health checks. *Arch Public Health* 2015 Mar 30;73(1):14-015-0064-1. eCollection 2015.
61. Jenkinson CE, Asprey A, Clark CE, Richards SH. Patients' willingness to attend the NHS cardiovascular health checks in primary care: a qualitative interview study. *BMC Fam Pract* 2015 Mar 8;16:33-015-0244-7.
62. Norman P, Fitter M. Patients' views on health screening in general practice. *Fam Pract* 1991 Jun;8(2):129-132.
63. Witte K. Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs* 1992;59(4):329-349.

64. Baker C, Loughren EA, Crone D, Kallfa' N. Patients' perceptions of a NHS Health Check in the primary care setting. *Qual Prim Care* 2015;22(5):232-237.
65. Riley R, Coghill N, Montgomery A, Feder G, Horwood J. Experiences of patients and healthcare professionals of NHS cardiovascular health checks: a qualitative study. *J Public Health (Oxf)* 2016 Sep;38(3):543-551.
66. Norman P. Predicting the uptake of health checks in general practice: invitation methods and patients' health beliefs. *Soc Sci Med* 1993 Jul;37(1):53-59.
67. Harkins C, Shaw R, Gillies M, Sloan H, Macintyre K, Scoular A, et al. Overcoming barriers to engaging socio-economically disadvantaged populations in CHD primary prevention: a qualitative study. *BMC Public Health* 2010 Jul 2;10:391-2458-10-391.
68. Zhong X, Potemans B, Zhang L, Oldenburg B. Getting a Grip on NCDs in China: an Evaluation of the Implementation of the Dutch-China Cardiovascular Prevention Program. *Int J Behav Med* 2015 Jun;22(3):393-403.
69. Eborall H, Stone M, Aujla N, Taub N, Davies M, Khunti K. Influences on the uptake of diabetes screening: a qualitative study in primary care. *Br J Gen Pract* 2012 Mar;62(596):e204-11.
70. Hardy S, Deane K, Gray R. The Northampton Physical Health and Wellbeing Project: the views of patients with severe mental illness about their physical health check. *Ment Health Fam Med* 2012 Dec;9(4):233-240.
71. Hart JT. The inverse care law. *Lancet* 1971 Feb 27;1(7696):405-412.
72. Delpech R, Ringa V, Falcoff H, Rigal L. Primary prevention of cardiovascular disease: More patient gender-based differences in risk evaluation among male general practitioners. *Eur J Prev Cardiol* 2016 Nov;23(17):1831-1838.
73. Lorant V, Boland B, Humblet P, Deliege D. Equity in prevention and health care. *J Epidemiol Community Health* 2002 Jul;56(7):510-516.
74. Artac M, Dalton ARH, Majeed A, Car J, Millett C. Effectiveness of a national cardiovascular disease risk assessment program (NHS Health Check): Results after one year. *Prev Med* 2013 /;57(2):129-134.
75. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013 Nov;63(616):e742-50.

Supplementary files

Supplementary file 1. Documentation of search strategies

University Library search consultation group

Date: February/March 2016

Topic/research question: Determinants of uptake of and compliance with selective prevention actions by individuals at high risk of cardio-metabolic disease and by healthcare professionals-a systematic review

Name of researcher(s): Axel C. Carlsson, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet

Librarian(s): Carl Gornitzki & Gun Brit Knutssön, University Library

Databases:

1. Medline (Ovid)
2. Embase (embase.com)
3. Cinahl (Ebsco)
4. PubMed (NOT Medline)

Total number of hits:

- Before deduplication: 10,566
- After deduplication: 6,683

1. Medline (Ovid)

Date of Search: 2016-03-10	Field tags:
Number of hits: 3,882	<ul style="list-style-type: none"> • .ti,ab,kf = title, abstract & keyword • exp/ = MeSH, exploded • adj3 = within three words
Comments:	
<p>PRIMARY PREVENTION</p> <p>1. Primary Prevention/ 2. exp Health Promotion/ 3. Preventive Health Services/ 4. Mass Screening/ 5. (risk assess* or health check* or risk check or risk questionair* or health promot* or screen*).ti,ab,kf. 6. (prevent* adj3 (primary or secondary or care or therapy or treatment or selective or program*)).ti,ab,kf. 7. or/1-6</p> <p>PARTICIPATION</p> <p>8. Patient participation/ 9. Motivation/ 10. exp Attitude to Health/ 11. exp Health Behavior/ 12. exp Health Personnel/ 13. exp "Attitude of Health Personnel"/ 14. exp Negativism/ 15. (participat* or non-participat* or nonparticipat* or attend* or nonattend or non-attend* or recruit* or uptake or response or nonresponse or non-response or responders).ti,ab,kf. 16. (complianc* or non-complianc* or noncomplianc* or barrier* or motiv* or willing* or challeng* or attitud* or adherenc* or nonadherenc* or non-adherenc* or incentiv* or engage* or retention or drop out* or dropout* or accept* or negativ* or nonacceptance or non-acceptance).ti,ab,kf. 17. or/8-16</p> <p>PRIMARY HEALTH CARE</p> <p>18. exp General Practice/ 19. Primary Health Care/ 20. General Practitioners/ 21. (primary adj3 (health or care)).ti,ab,kf. 22. ((general or family) adj3 (pract* or physician*)).ti,ab,kf. 23. or/18-22</p> <p>CARDIOMETABOLIC</p> <p>24. exp Stroke/ 25. exp Cardiovascular Disease/ 26. exp Renal Insufficiency, Chronic/ 27. exp Diabetes Mellitus/ 28. (hypertens* or (high adj3 blood pressur*) or atheroscleros* or atherogenes* or stroke* or cerebrovascular accident* or (coronary adj3 disease*) or cardio* or (peripher* adj3 arter* adj3 disease*) or myocardical infarct* or heart attack* or angina pectoris or angor pectoris or stenocardia* or aortic aneurysm* or (transient adj3 ischem* adj3 attack*) or (transient adj3 cerebral adj3 ischem*) or (chronic adj3 (renal or kidney) adj3 (disease* or insuffic* or failure)) or diabet*).ti,ab,kf. 29. or/24-28</p> <p>30. 7 and 17 and 23 and 29 31. remove duplicates from 30</p>	

2. Embase (embase.com)

<p>Date of Search: 2016-03-10</p> <p>Number of hits: 4,981</p> <p>Comments:</p>	<p>Field tags:</p> <ul style="list-style-type: none"> • ab,ti = title & abstract • /exp = Emtree, exploded • /de = Emtree, non-exploded • NEAR/3 = within three words
Results	
	4,981
#30 #29 AND ('article'/it OR 'review'/it)	7,552
#29 #27 NOT #28	4,912,694
#28 [animals]/lim NOT [humans]/lim	7,559
#27 #7 AND #15 AND #20 AND #26	4,289,275
#26 #21 OR #22 OR #23 OR #24 OR #25	2,136,699
#25 hypertens*:ab,ti OR (high NEAR/3 'blood pressur*'):ab,ti OR atheroscleros*:ab,ti OR athero- genes*:ab,ti OR stroke*:ab,ti OR 'cerebrovascular accident*':ab,ti OR (coronary NEAR/3 dis- ease*):ab,ti OR cardio*:ab,ti OR (peripher* NEAR/3 arter* NEAR/3disease*):ab,ti OR 'myocar- dial infarct*':ab,ti OR 'heart attack*':ab,ti OR 'angina pectoris':ab,ti OR 'angor pectoris':ab,ti ORstenocardia*:ab,ti OR 'aortic aneurysm*':ab,ti OR (transient NEAR/3 ischem* NEAR/3 at- tack*):ab,ti OR (transient NEAR/3 cerebralNEAR/3 ischem*):ab,ti OR (chronic NEAR/3 (renal OR kidney) NEAR/3 (disease* OR insuffic* OR failure)):ab,ti OR diabet*:ab,ti	716,813
#24 'diabetes mellitus'/exp	57,386
#23 'chronic kidney failure'/de	3,415,832
#22 'cardiovascular disease'/exp	

	237,804
#21 'cerebrovascular accident'/exp	
	300,424
#20 #16 OR #17 OR #18 OR #19	
	123,502
#19 ((general OR family) NEAR/3 (pract* OR physician*)):ab,ti	
	131,016
#18 (primary NEAR/3 (health OR care)):ab,ti	
	122,721
#17 'primary health care'/exp	
	73,962
#16 'general practice'/de	
	6,656,812
#15 #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14	
	3,004,155
#14 complianc*:ab,ti OR 'non-complianc*':ab,ti OR noncomplianc*:ab,ti OR barrier*:ab,ti OR moti- v*:ab,ti OR willing*:ab,ti OR challeng*:ab,ti OR attitud*:ab,ti OR adherenc*:ab,ti OR nonad- herenc*:ab,ti OR 'non-adherenc*':ab,ti OR incentiv*:ab,ti OR engage*:ab,ti OR retention:ab,ti OR 'drop out*':ab,ti OR dropout*:ab,ti OR accept*:ab,ti OR negativ*:ab,ti OR nonaccep- tance:ab,ti OR 'non-acceptance':ab,ti	
	3,146,649
#13 participat*:ab,ti OR 'non-participat*':ab,ti OR nonparticipat*:ab,ti OR attend*:ab,ti OR nonat- tend:ab,ti OR 'non-attent*':ab,ti OR recruit*:ab,ti OR uptake:ab,ti OR response:ab,ti OR nonre- sponse:ab,ti OR 'non-response':ab,ti OR responders:ab,ti	
	1,100,293
#12 'health care personnel'/exp	
	299,777
#11 'health behavior'/exp	
	79,278
#10 'motivation'/de	

#9	144,414
'health personnel attitude'/exp	
#8	287,964
'patient attitude'/exp	
#7	1,127,514
#1 OR #2 OR #3 OR #4 OR #5 OR #6	
#6	209,017
(prevent* NEAR/3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)):ab,ti	
#5	790,851
'risk assess*':ab,ti OR 'health check*':ab,ti OR 'risk check':ab,ti OR 'risk questionnaire*':ab,ti OR 'health promot*':ab,ti OR screen*':ab,ti	
#4	178,443
'mass screening'/exp	
#3	22,949
'preventive health service'/de	
#2	76,434
'health promotion'/exp	
#1	31,228
'primary prevention'/de	



3. Cinahl (Ebsco)

Date of Search: 2016-03-10	Field tags:
Number of hits: 1,533	<ul style="list-style-type: none"> • MH = Cinahl Heading • N3 = Within three words • TI = Titel • AB = Abstract
Comments:	
S54	S33 AND S41 AND S47 AND S53
S53	S48 OR S49 OR S50 OR S51 OR S52 TI ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR athero- genes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardial infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*)) OR AB ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardial infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*))
S52	
S51	(MH "Diabetes Mellitus+")
S50	(MH "Renal Insufficiency, Chronic+")
S49	(MH "Cardiovascular Diseases+")
S48	(MH "Stroke+")
S47	S42 OR S43 OR S44 OR S45 OR S46 TI (((general OR family) N3 (pract* OR physician*))) OR AB (((general OR family) N3 (pract* OR physician*)))
S46	
S45	TI ((primary N3 (health OR care))) OR AB ((primary N3 (health OR care)))
S44	(MH "Physicians, Family")
S43	(MH "Primary Health Care")
S42	(MH "Family Practice")
S41	S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 TI ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance")) OR AB ((complianc* OR "non-complianc*" OR noncomplianc* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance"))
S40	

S39	TI ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders)) OR AB ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders))
S38	(MH "Health Personnel+")
S37	(MH "Attitude to Illness+")
S36	(MH "Attitude of Health Personnel+")
S35	(MH "Attitude to Health+")
S34	(MH "Motivation")
S33	S28 OR S29 OR S30 OR S31 OR S32
S32	TI ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*))) OR AB ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)))
S31	TI (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnaire*" OR "health promot*" OR screen*)) OR AB (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnaire*" OR "health promot*" OR screen*))
S30	(MH "Health Screening+")
S29	(MH "Health Promotion+")
S28	(MH "Preventive Health Care+")
S27	S6 AND S14 AND S20 AND S26
S26	S21 OR S22 OR S23 OR S24 OR S25
S25	TI ((hypertens* OR (high N3 "blood pressur*")) OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardial infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*)) OR AB ((hypertens* OR (high N3 "blood pressur*") OR atheroscleros* OR atherogenes* OR stroke* OR "cerebrovascular accident*" OR (coronary N3 disease*) OR cardio* OR (peripher* N3 arter* N3 disease*) OR "myocardial infarct*" OR "heart attack*" OR "angina pectoris" OR "angor pectoris" OR stenocardia* OR "aortic aneurysm*" OR (transient N3 ischem* N3 attack*) OR (transient N3 cerebral N3 ischem*) OR (chronic N3 (renal OR kidney) N3 (disease* OR insuffic* OR failure)) OR diabet*))
S24	(MH "Diabetes Mellitus+")
S23	(MH "Renal Insufficiency, Chronic+")
S22	(MH "Cardiovascular Diseases+")
S21	(MH "Stroke+")
S20	S15 OR S16 OR S17 OR S18 OR S19
S19	TI (((general OR family) N3 (pract* OR physician*))) OR AB (((general OR family) N3 (pract* OR physician*)))
S18	TI ((primary N3 (health OR care))) OR AB ((primary N3 (health OR care)))
S17	(MH "Physicians, Family")
S16	(MH "Primary Health Care")



S15	(MH "Family Practice")
S14	S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 TI ((compliant* OR "non-compliant*" OR noncompliant* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance")) OR AB ((compliant* OR "non-compliant*" OR noncompliant* OR barrier* OR motiv* OR willing* OR challeng* OR attitud* OR adherenc* OR nonadherenc* OR "non-adherenc*" OR incentiv* OR engage* OR retention OR "drop out*" OR dropout* OR accept* OR negativ* OR nonacceptance OR "non-acceptance"))
S13	TI ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders)) OR AB ((participat* OR "non-participat*" OR nonparticipat* OR attend* OR nonattend OR "non-attend*" OR recruit* OR uptake OR response OR nonresponse OR "non-response" OR responders))
S12	
S11	(MH "Health Personnel+")
S10	(MH "Attitude to Illness+")
S9	(MH "Attitude of Health Personnel+")
S8	(MH "Attitude to Health+")
S7	(MH "Motivation")
S6	S1 OR S2 OR S3 OR S4 OR S5 TI ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*))) OR AB ((prevent* N3 (primary OR secondary OR care OR therapy OR treatment OR selective OR program*)))
S5	TI (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnair*" OR "health promot*" OR screen*)) OR AB (("risk assess*" OR "health check*" OR "risk check" OR "risk questionnair*" OR "health promot*" OR screen*))
S4	
S3	(MH "Health Screening+")
S2	(MH "Health Promotion+")
S1	(MH "Preventive Health Care+")

4. PubMed

<p>Date of Search: 2016-03-10</p> <p>Number of hits: 170</p> <p>Comments: PubMed NOT Medline]</p>	
<p>(((((risk assess*[Title/Abstract] OR health check*[Title/Abstract] OR "risk check"[Title/Abstract] OR risk questionnair*[Title/Abstract] OR health promot*[Title/Abstract] OR screen*[Title/Abstract])) OR (prevent*[Title/Abstract] AND (primary[Title/Abstract] OR secondary[Title/Abstract] OR care[Title/Abstract] OR therapy[Title/Abstract] OR treatment[Title/Abstract] OR selective[Title/Abstract] OR program*[Title/Abstract])))</p> <p style="text-align: center;">AND</p> <p>((participat*[Title/Abstract] OR non-participat*[Title/Abstract] OR nonparticipat*[Title/Abstract] OR attend*[Title/Abstract] OR nonattend[Title/Abstract] OR non-attend*[Title/Abstract] OR recruit*[Title/Abstract] OR uptake[Title/Abstract] OR response[Title/Abstract] OR nonresponse[Title/Abstract] OR non-response[Title/Abstract] OR responders[Title/Abstract] OR complianc*[Title/Abstract] OR non-complianc*[Title/Abstract] OR noncomplianc*[Title/Abstract] OR barrier*[Title/Abstract] OR motiv*[Title/Abstract] OR willing*[Title/Abstract] OR challeng*[Title/Abstract] OR attitud*[Title/Abstract] OR adherenc*[Title/Abstract] OR nonadherenc*[Title/Abstract] OR non-adherenc*[Title/Abstract] OR incentiv*[Title/Abstract] OR engage*[Title/Abstract] OR retention[Title/Abstract] OR drop out*[Title/Abstract] OR dropout*[Title/Abstract] OR accept*[Title/Abstract] OR negativ*[Title/Abstract] OR nonacceptance[Title/Abstract] OR non-acceptance[Title/Abstract])))</p> <p style="text-align: center;">AND</p> <p>((("primary health"[Title/Abstract] OR "primary care"[Title/Abstract])) OR (general pract* OT general physician*[Title/Abstract] OR family pract*[Title/Abstract] OR family physician*[Title/Abstract]))))</p> <p style="text-align: center;">AND</p> <p>((hypertens*[Title/Abstract] OR "high blood pressur*" [Title/Abstract] OR atheroscleros*[Title/Abstract] OR atherogenes*[Title/Abstract] OR stroke*[Title/Abstract] OR "cerebrovascular accident*" [Title/Abstract] OR "coronary disease*" [Title/Abstract] OR cardio*[Title/Abstract] OR "peripheral artery disease*" [Title/Abstract] OR "myocardial infarct*" [Title/Abstract] OR "heart attack*" [Title/Abstract] OR "angina pectoris" [Title/Abstract] OR "angor pectoris" [Title/Abstract] OR stenocardia*[Title/Abstract] OR "aortic aneurysm*" [Title/Abstract] OR "transient ischemic attack*" [Title/Abstract] OR "transient cerebral ischemic" [Title/Abstract] OR "chronic renal" [Title/Abstract] OR "chronic kidney" [Title/Abstract] OR diabet*[Title/Abstract]))</p> <p style="text-align: center;">NOT</p> <p>medline[sb]</p>	



Supplementary file 2a. Barriers and facilitators for patients to participate in a health check for CMD with references

Category	Barriers / facilitators (references)	Number
Patient / socio-demographic characteristics	SES (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16)	16/22
	Age (2), (3), (7), (8), (9), (17), (10), (18), (11), (12), (13), (19)	12/18
	Smoking status (2), (4), (5), (6), (20), (10), (18), (12), (15), (19)	10/14
	Sex (4), (10), (11), (14), (15)	5/14
	Medical care (3), (20), (1), (2), (4), (12), (21), (22), (23), (24), (25)	11/12
	Social life (1), (2), (4), (6), (10), (11), (12), (21), (26)	9/12
	Ethnicity (6), (17), (18), (11), (27), (14)	6/10
	Family history of CMD (28), (29), (30), (31), (32)	5/9
	Weight (2), (3), (4), (9)	4/9
	Alcohol consumption (2), (33), (12)	3/9
	History of, or actual disease (12), (34), (29), (22), (31), (32), (24)	7/8
	Risk factors for CVD (9), (3), (5), (8), (17), (19)	6/6
	Lifestyle (2), (4), (12), (34)	4/6
	Other (11), (1), (8), (12)	4/4
	Attitudes	Expectations about outcome (3), (33), (34), (14), (29), (25), (16), (28), (35), (30), (21), (22), (23), (31), (32), (24)
Responsibility for / importance health (1), (36), (4), (14), (29), (30), (22), (23), (32), (24), (21), (26)		12/15
Perceived severity / susceptibility (3), (20), (37), (28), (38), (21), (22), (23), (31), (32)		10/13
Attitude towards prevention / health check (34), (14), (1), (3), (36), (6), (39), (30), (22), (23), (32), (24)		12/12
Way of invitation / information (14), (1), (3), (33), (25), (37), (28), (29), (35), (38), (23), (32), (24)		13/16
(lack of) time (14), (20), (33), (16), (37), (21), (22), (23), (31), (32), (24)		11/12
Appointment (3), (18), (37), (38), (21), (23), (31), (32), (24), (25)		10/10
Accessibility (37), (35), (23), (32)		4/4
Other priorities (34), (37), (22)		3/3
Duration of the program (11), (19)		2/2
Healthcare provider	Costs (26)	1/1
	Experience GP / health care (25), (37), (39), (21), (23)	5/5
	Wasting time doctor (29), (22), (32), (24)	4/5
	Practice characteristics (17), (18), (27), (14)	4/4

Bold numbers: > 100 participants and/or direct comparison attenders and non-attenders. CVD, cardiovascular disease; CMD, cardiometabolic disease; GP, general practitioner; SES, socio-economic status.

Supplementary file 2b. Barriers and facilitators for people to participate in a health check for CMD

Context	Barriers / non-participants	Facilitators / participants	No difference
Patient/socio-demographic characteristics	Personal characteristics SES Low education (11) Manual occupations (4) Being unemployed (6), (7) Lower income (7), (11) Lower social class (3), (6) Lower SES (14) More deprivation (9), (15) Living in rented accommodation (4), less often home owner (5) No /less access to a car (4), (5)	Personal characteristics SES Middle education (11), better educated (1) Be unemployed (8) Women who work outside house (1) Paid employment (1) Higher social class (1), (2), (4) Higher SES (12) Lower SES (16) Middle / high social status (10) More deprived areas (13)	Personal characteristics SES Education level (6), (7), (8), (10), (33), high education (3), completion full time education (4) Persons with only elementary school (20) Employment status (4) Lower-in between- high employee (7), men with occupational training (26), unskilled – skilled labourers (7) Income level (8) SES (7), (27) Deprivation quintile / level (18), (34) Type of residential area (12)
	Age Higher age (3) Lower age (7), (9), (11) Younger men (17)	Age Age ≥45 (2) Older age (19), (8), (17), (10), (13), up to 75 (18), (12) Women in youngest age group (17)	Age Age (1), (4), (6), (33), (27) age >65 (34)
	Smoking status (heavy) Smokers (19), (2), (4), (6), (20), (18) smoking status missing in file (18) Current/former smoker (5)	Smoking status Non-smoker (10), (12), (15)	Smoking status Smoking (3), (17), (33), (34) smoking prevalence (5) Women: former smoker (5)
Sex Men (4), (11), (14)	Sex Women (10), (15)	Sex Sex (1), (6), (8), (9), (10), (33), (13), (27), (34) men (20)	
Medical care Already under medical care / recently examined (21), (22), (23), (3), (20), (24) Less often visited surgery in last year (1) Blood pressure/cholesterol recently checked (24)	Medical care Frequent consulters (25), (2) Visited surgery more frequently (4) Recent contact with own practice (1) Performed more health approved practices (1) Higher use of outpatient care (12)	Medical care Already yearly check-up (33)	

Supplementary file 2b. Continued

Context	Barriers / non-participants	Facilitators / participants	No difference
	<p>Social life Unmarried (4) Being single mother (6) Being single (11) Being responsible for child <5 years or other dependants (21) Pregnant (21)</p> <p>Ethnicity Of African origin (6) Non-native Swedes (11) Turkish, Moroccan, Surinamese ethnicity (vs Dutch) (27) Moroccan or Surinamese (14) Native Dutch (vs. non-western) (27)</p> <p>Family history of CMD Lack of family history of CVD (stroke, heart disease) (31), (32)</p> <p>Weight Overweight (2), higher BMI (3), (9) obesity (4)</p> <p>Alcohol consumption Heavy drinkers (2), (33)</p> <p>History of, or actual disease Actual health problems (22), (chronic) health problems (31), (32)</p>	<p>Social life Married (2), (10), (12) Cohabitants (26) No children <5 years old (1) No dependants/close friends (1) <6 contacts per month with friends/relatives (1) Strong social support (12)</p> <p>Ethnicity Patients from south Asia (18) or mixed ethnic background (vs. White) (17) Black (vs White) (18)</p> <p>Family history of CMD Family history of DM (for DM screening program) (31) Family history of stroke/heart disease (28), (29), (30) Knowing someone who had been diagnosed with heart condition/life changing illness (29)</p> <p>Alcohol consumption Alcohol consumption in women (12)</p> <p>History of, or actual disease Not feeling well (24) Having a serious illness (29) Previous experience of personal health problems (32) Higher self-rated health in men (12) Better reported health (34)</p>	<p>Social life Marital status (1), (8), (33) Single households (20) Separated/divorced/widowed (vs. single) (12) Women having children (6)</p> <p>Ethnicity Mixed/other ethnicity (18) Ethnic background (33), (34), (13), (27) Born in the Netherlands (10)</p> <p>Family history of CMD Family history of coronary heart disease / DM/ CVD (3), (5), (10), (33)</p> <p>Weight Weight / BMI / quetelet's index (6), (33) obesity (12), waist circumference (10), within approved range for weight and height (1)</p> <p>Alcohol consumption (Increased) Alcohol consumption (19), (3), (4), (6), (34) in men (12) Drink <5 drinks at one time (1)</p> <p>History of, or actual disease Being disabled (34) Having long-standing illness or disability (4) Self-rated health status (4) in women (12)</p>

<p>Risk factors for CVD Less likely to be prescribed antihypertensive drugs (9) Higher mean cholesterol level, mean SBP and DBP (3) Higher Dundee risk score (5)</p> <p>Lifestyle Less healthy diet (2) , (4)</p> <p>Other Semi-urban or urban environments (11)</p>	<p>Risk factors for CVD Population at higher CVD risk (e.g. more socially disadvantaged) (19) Increased risk score (8) Diagnosed with hypertension (17)</p> <p>Lifestyle Healthy diet (34) Greater fruit and vegetable consumption (12) Higher physical activity (12) , (34)</p> <p>Other Attend church regularly (1) Live in country-side (8) Type of statutory health insurance in women (12)</p>	<p>Risk factors for CVD Number of prescribed drugs (9) Having risk factors: SBP, DBP, cholesterol, glucose, BMI (5)</p> <p>Lifestyle Diet (6) Physical (in)activity (4) , (6) , (33) More physical activity in men (12)</p> <p>Other Statutory health insurance in men (12)</p>
<p>Attitudes</p> <p>Expectations about outcome Don't want to know risk profile (33) Don't want to know outcome/ CVD risk or possible risk factors to be revealed (22) , (32) Don't want feeling of good health to be disturbed (22) Possible negative effect on quality of life (22) Would be a challenge to change lifestyle (32) Make people feel guilty about lifestyle (22) Might find health check embarrassing (21) Concerns about lack of follow-up (34) Fear about (poor) outcome (21), (3) , (24) / may be no cure for revealed diseases (22) Anxiety after unexpected results (30) Could lead to anxious feelings (22) Fear of the consequences (lifestyle change, medication) (23) Gives false feeling of security (22) Afraid it will affect life/insurance/holiday (31) Privacy reasons (33)</p>	<p>Expectations about outcome Wanting to know risk (14) Perception of 'being checked upon' (35) Wanting to know everything is alright (25) Reassurance (28) , (35) , (30) , (21), (32) , (24) , (29) Being informed about risk factors/ early warning signs CVD (30) Want to know CVD risk, diagnosis and start treatment (28) Fear of test results and/or adjusting lifestyle (14) Not worried by invitation/ screening (25) Did not seem to cause fear (35) , (21) Attendees: 6% found it worrying (16)</p>	<p>Expectations about outcome Would have positive impact on health (38) Afraid of problems with mortgage/ insurance (33) Afraid of high risk outcome (33) Afraid of medical consequences in case of high risk (33) Worries (36)</p>



Supplementary file 2b. Continued

Context	Barriers / non-participants	Facilitators / participants	No difference
	<p>Responsibility for/ importance health It is individuals' own responsibility to maintain good health (22) Powerful others (health professionals) to control their health (1) Belief in chance/ health is affected by factors beyond personal control/luck (1) Being told off or mollycoddled (24) Feeling authorities are over-officious (22) Lack of feeling obligation to attend (23) Lack of interest, lazy, forgot (21) Avoids thinking about health (24)</p>	<p>Responsibility for/ importance health Belief in personal control (1) Perceived control of staying healthy (14) Change behavior is responsibility of the patient (29) More often considered avoidance heart disease to be pure chance (26) Better motivated to look after health (1) Willingness to change behavior (4) Previous attempts / wanting to increase exercise or change diet (4) Moral responsibility to attend if asked (32) Accept everything that is offered, there must be a good reason for invitation (24) Proactive towards health: happy to receive advice, chance to change lifestyle, prevention is better than cure (24) Reinforcement/Positive lifestyle changes (30) Value health (1) , (36)</p>	<p>Responsibility for/ importance health Belief in internal control over health (1) Internal HLOC (health locus of control), powerful others HLOC (36) Agree with: I can do a lot myself to prevent getting heart disease (26) If I follow the advice of my GP I can completely avoid getting a heart disease (26) Chance HLOC (36) No influence on risk profile (33) Motivation to alter unhealthy aspects of their lifestyle before check (6) Felt under no pressure to attend (25) I do not have strong enough character to prevent getting a heart disease (26) 'I take my health for granted' (1) 'I do not think about health much' (1)</p>
	<p>Perceived severity / susceptibility Unnecessary because feeling well (3) Aware of having certain risk factors (3) Feeling healthy / no symptoms don't need screening (20-23, 32, 37, 38) Believes risk is low (32) Healthy lifestyle (31) , (32) Other diseases (e.g. cancer) perceived as more serious disease (31) Perceived lack of personal relevance (23)</p>	<p>Perceived severity / susceptibility Concerns about health (28)</p>	<p>Perceived severity/ susceptibility Risk of getting heart disease is small for me (26) Very serious to get heart disease (26) Susceptibility (36) Severity (36) Anxious about health (4) Perception of health good-bad (26)</p>

Attitude towards prevention / health check	Attitude towards prevention / health check	Attitude towards prevention / health check	Attitude towards prevention / health check
<p>Negative attitude towards preventive medicine / health screening (22) , (34) , (14)</p> <p>Women who had less cervical smear in last 3 years (6)</p> <p>Apathy (3)</p> <p>Bad experience of someone else (24)</p>	<p>Positive attitude towards prevention / health check (39) , (30) , (23) , (32)</p> <p>Intention to attend more often attend (36)</p> <p>Expressing attention to complete the HRA (14)</p> <p>Wanting to participate (14)</p> <p>Welcome opportunity to check health (32)</p> <p>Perceiving no barriers (14)</p> <p>Accepted legitimacy of GP's interest in patients' lifestyle (1)</p> <p>More likely to attend other types of routine checks (cervical smear, dentist) and take preventive measures such as 7-8 hours sleep, physical activity (1)</p> <p>People should be made aware of unhealthy behavior (22)</p>	<p>Did not receive invitation (37) , (38) , (1) , (3) , (24)</p> <p>Lack of information (23) / misread (24) / did not understand invitation (33)</p> <p>Inaccurate expectations (32)</p> <p>Mass mailing (37)</p> <p>Lack of awareness of the program (32)</p> <p>Difficulties accessing the internet (33)</p> <p>Not familiar with health check (33)</p> <p>Language barrier (23)</p>	<p>Benefits (36)</p> <p>Positive view towards check (34)</p> <p>Requested a cervical smear (6)</p> <p>Motivational barriers (36)</p>
Practical reasons	Way of invitation / information	Way of invitation / information	Way of invitation / information
	<p>Additional phone call after invitation (14)</p> <p>Positive attitude towards the invitation (25) , (14)</p> <p>Good explanation about screening (37) , clear information to make informed decision to participate (29)</p> <p>Use of social networks, on-street interviewing, door-to-door calling, peer referral and outreach workers in local events for engagement (37) , invitation face-to-face / from reliable source (37) , invitation by GP / health center (35) , (38)</p> <p>No reason to decline invitation (35)</p> <p>Positive about letter and opportunistic invitation (25)</p> <p>Access to health information and guidance (28)</p> <p>Recommended by health professional (24)</p> <p>Understood what it was for (25)</p>	<p>Not familiar with health check (33)</p> <p>Language barrier (23)</p>	<p>Invitation by letter or opportunistically (36)</p> <p>Informed choice invitation vs. standard invitation (9)</p> <p>No support that invitation aroused anxiety (21)</p> <p>Felt practice were interested in health (25)</p>

Supplementary file 2b. Continued

Context	Barriers / non-participants	Facilitators / participants	No difference
	<p>(Lack of) Time Lack of time / feeling busy (21), (22) , (23) , (20), (33) , (24) , (14) Family / work commitments (need to take time of (37) , (23) , (20), (31) , (32) . Not easy to go away from home (21) Shift working (21) Pay other to do caring (32)</p> <p>Appointment Check only available for limited time (24) Did not remember to attend (3) Difficult to arrange appointment (32) , (24) , lack of appointment times outside working hours (23) Responsibility for patient to make appointment (37) Early morning appointments for OGTT (diabetes screening) (31) Time and place not convenient (38) Appointment inconvenient, forgot (21) Difficult to get appointment with GP (32)</p> <p>Accessibility Difficult to access practice (not close, parking difficult) (23) , (32)</p>	<p>(Lack of) Time Retired, working flexible hours, shifts (32) Attenders: 6% found it waste of time (16)</p> <p>Appointment Drop-in sessions, no appointment needed (37) Easy access to appointment (38) , (25) Recorded phone number (18)</p> <p>Accessibility Informal (non-health) location for screening (37) , delivering in pharmacies (32) Anonymity in other locations than GP (23) Good accessibility (35) , location on walking distance, easy parking (32)</p> <p>Duration of the program Progress program / long term (11) , (19)</p> <p>Costs Free examination (26)</p>	<p>(Lack of) Time Time barriers (36)</p> <p>Appointment Administrative arrangements not a barrier (21)</p>
	<p>Other priorities Major life events (22) Not a priority / other priorities (housing, violence, addiction) (37) Personal circumstances (34)</p>		

Healthcare provider / GP	Experience GP / health care	Experience GP / health care
<p>Negative experience care services (37) , dissatisfaction care GP (23) Do not like staff there (21)</p>	<p>Good experience with GP (25) Being treated by the same healthcare professional/nurse (39) General practice for most people most convenient (23) Health check should be done by a doctor (21)</p>	<p>Wasting time doctor Wasting time doctor/nurse (24) Feeling healthy- should not bother the doctor (32) , it is good not to go to GP (24) Would contact GP if symptoms (22) Take time and resources from people who are ill (32)</p>
<p>Practice characteristics</p>	<p>GP practice non-Western (vs. mixed/native Dutch) (27) Patients from practice with non-Western population (14)</p>	<p>Practice characteristics Single-handed GPs who were paid to provide screening (18) Patients registered with smaller practices (<3000) (17) Men registered with single-hand GPs (18)</p>
<p>Practice characteristics</p>	<p>GP practice non-Western (vs. mixed/native Dutch) (27) Patients from practice with non-Western population (14)</p>	<p>Practice characteristics GP practice (27)</p>

SES, Socio-economic status; GP, general practitioner; CVD, cardiovascular disease; CMD, cardiometabolic disease; DM, diabetes mellitus; BMI, Body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; HLOC, health locus of control; OGTT, oral glucose tolerance test



Supplementary references

1. Pill R, French J, Harding K, Stott N. Invitation to attend a health check in a general practice setting: Comparison of attenders and non-attenders. *J R Coll Gen Pract.* 1988 Feb;38(307):53-6.
2. Waller D, Agass M, Mant D, Coulter A, Fuller A, Jones L. Health checks in general practice: Another example of inverse care? *BMJ.* 1990 Apr 28;300(6732):1115-8.
3. Jones A, Cronin PA, Bowen M. Comparison of risk factors for coronary heart disease among attenders and non-attenders at a screening programme. *Br J Gen Pract.* 1993 Sep;43(374):375-7.
4. Thorogood M, Coulter A, Jones L, Yudkin P, Muir J, Mant D. Factors affecting response to an invitation to attend for a health check. *J Epidemiol Community Health.* 1993 Jun;47(3):224-8.
5. Davies G, Pyke S, Kinmonth AL. Effect of non-attenders on the potential of a primary care programme to reduce cardiovascular risk in the population. family heart study group. *BMJ.* 1994 Dec 10;309(6968):1553-6.
6. Griffiths C, Cooke S, Toon P. Registration health checks: Inverse care in the inner city? *Br J Gen Pract.* 1994 May;44(382):201-4.
7. Weinehall L, Hallgren CG, Westman G, Janlert U, Wall S. Reduction of selection bias in primary prevention of cardiovascular disease through involvement of primary health care. *Scand J Prim Health Care.* 1998 Sep;16(3):171-6.
8. Dalsgaard E, Lauritzen T, Christiansen T, Mai KS, Borch-Johnsen K, Sandbæk A. Socioeconomic factors related to attendance at a type 2 diabetes screening programme. *Diabetic Med.* 2009;26(5):518-25.
9. Marteau TM, Mann E, Prevost AT, Vasconcelos JC, Kellar I, Sanderson S, et al. Impact of an informed choice invitation on uptake of screening for diabetes in primary care (DICISION): Randomised trial. *BMJ.* 2010 May 13;340:c2138.
10. Klijs B, Otto SJ, Heine RJ, van der Graaf Y, Lous JJ, de Koning HJ. Screening for type 2 diabetes in a high-risk population: Study design and feasibility of a population-based randomized controlled trial. *BMC Public Health.* 2012 Aug 17;12:671,2458-12-671.
11. Norberg M, Blomstedt Y, Lonnberg G, Nystrom L, Stenlund H, Wall S, et al. Community participation and sustainability - evidence over 25 years in the vasterbotten intervention programme. *Glob Health Action.* 2012 Jan;5(1):19166.
12. Hoebel J, Starker A, Jordan S, Richter M, Lampert T. Determinants of health check attendance in adults: Findings from the cross-sectional german health update (GEDA) study. *BMC Public Health.* 2014 2014;14:913.
13. Attwood S, Morton K, Sutton S. Exploring equity in uptake of the NHS health check and a nested physical activity intervention trial. *J Public Health (Oxf).* 2016 Sep;38(3):560-8.

14. Groenenberg I, Crone MR, van Dijk S, Ben Meftah J, Middelkoop BJ, Assendelft WJ, et al. Determinants of participation in a cardiometabolic health check among underserved groups. *Prev Med Rep*. 2016 Apr 30;4:33-43.
15. Lang SJ, Abel GA, Mant J, Mullis R. Impact of socioeconomic deprivation on screening for cardiovascular disease risk in a primary prevention population: A cross-sectional study. *BMJ Open*. 2016 Mar 21;6(3):e009984,2015-009984.
16. Ochera J, Hilton S, Bland JM, Jones DR, Dowell AC. Patients' experiences of health checks in general practice: A sample survey. *Fam Pract*. 1994 Mar;11(1):26-34.
17. Dalton AR, Bottle A, Okoro C, Majeed A, Millett C. Uptake of the NHS health checks programme in a deprived, culturally diverse setting: Cross-sectional study. *J Public Health (Oxf)*. 2011 Sep;33(3):422-9.
18. Lambert AM, Burden AC, Chambers J, Marshall T, Heart of Birmingham Teaching Primary Care Trust. Cardiovascular screening for men at high risk in heart of birmingham teaching primary care trust: The 'deadly trio' programme. *J Public Health (Oxf)*. 2012 Mar;34(1):73-82.
19. Robson J, Dostal I, Sheikh A, Eldridge S, Madurasinghe V, Griffiths C, et al. The NHS health check in england: An evaluation of the first 4 years. *BMJ Open*. 2016 Jan 13;6(1):e008840,2015-008840.
20. Wall M, Teeland L. Non-participants in a preventive health examination for cardiovascular disease: Characteristics, reasons for non-participation, and willingness to participate in the future. *Scand J Prim Health Care*. 2004 Dec;22(4):248-51.
21. Pill R, Stott N. Invitation to attend a health check in a general practice setting: The views of a cohort of non-attenders. *J R Coll Gen Pract*. 1988 Feb;38(307):57-60.
22. Nielsen KD, Dyhr L, Lauritzen T, Malterud K. You can't prevent everything anyway: A qualitative study of beliefs and attitudes about refusing health screening in general practice. *Fam Pract*. 2004 Feb;21(1):28-32.
23. Ellis N, Gidlow C, Cowap L, Randall J, Iqbal Z, Kumar J. A qualitative investigation of non-response in NHS health checks. *Arch Public Health*. 2015 Mar 30;73(1):14,015-0064-1. eCollection 2015.
24. Jenkinson CE, Asprey A, Clark CE, Richards SH. Patients' willingness to attend the NHS cardiovascular health checks in primary care: A qualitative interview study. *BMC Fam Pract*. 2015 Mar 8;16:33,015-0244-7.
25. Norman P, Fitter M. Patients' views on health screening in general practice. *Fam Pract*. 1991 Jun;8(2):129-32.
26. Christensen B. Characteristics of attenders and non-attenders at health examinations for ischaemic heart disease in general practice. *Scand J Prim Health Care*. 1995 Mar;13(1):26-31.

27. Groenenberg I, Crone MR, van Dijk S, Ben Meftah J, Middelkoop BJ, Assendelft WJ, et al. Response and participation of underserved populations after a three-step invitation strategy for a cardiometabolic health check. *BMC Public Health*. 2015 Sep 3;15:854,015-2139-x.
28. Baker C, Loughren EA, Crone D, Kallfa' N. Patients' perceptions of a NHS health check in the primary care setting. *Qual Prim Care*. 2015;22(5):232-7.
29. Ismail H, Atkin K. The NHS health check programme: Insights from a qualitative study of patients. *Health Expect*. 2016 Apr;19(2):345-55.
30. Riley R, Coghill N, Montgomery A, Feder G, Horwood J. Experiences of patients and healthcare professionals of NHS cardiovascular health checks: A qualitative study. *J Public Health (Oxf)*. 2016 Sep;38(3):543-51.
31. Eborall H, Stone M, Aujla N, Taub N, Davies M, Khunti K. Influences on the uptake of diabetes screening: A qualitative study in primary care. *Br J Gen Pract*. 2012 Mar;62(596):e204-11.
32. Burgess C, Wright AJ, Forster AS, Dodhia H, Miller J, Fuller F, et al. Influences on individuals' decisions to take up the offer of a health check: A qualitative study. *Health Expect*. 2015 Dec;18(6):2437-48.
33. Van der Meer V, Nielen MM, Drenthen AJ, Van Vliet M, Assendelft WJ, Schellevis FG. Cardiometabolic prevention consultation in the netherlands: Screening uptake and detection of cardiometabolic risk factors and diseases--a pilot study. *BMC Fam Pract*. 2013 ;14:29.
34. Krska J, du Plessis R, Chellaswamy H. Views and experiences of the NHS health check provided by general medical practices: Cross-sectional survey in high-risk patients. *J Public Health (Oxf)*. 2015 Jun;37(2):210-7.
35. Ligthart SA, van den Eerenbeemt KD, Pols J, van Bussel EF, Richard E, Moll van Charante EP. Perspectives of older people engaging in nurse-led cardiovascular prevention programmes: A qualitative study in primary care in the netherlands. *Br J Gen Pract*. 2015 Jan;65(630):e41-8.
36. Norman P. Predicting the uptake of health checks in general practice: Invitation methods and patients' health beliefs. *Soc Sci Med*. 1993 Jul;37(1):53-9.
37. Harkins C, Shaw R, Gillies M, Sloan H, Macintyre K, Scoular A, et al. Overcoming barriers to engaging socio-economically disadvantaged populations in CHD primary prevention: A qualitative study. *BMC Public Health*. 2010 Jul 2;10:391,2458-10-391.
38. Zhong X, Potemans B, Zhang L, Oldenburg B. Getting a grip on NCDs in china: An evaluation of the implementation of the dutch-china cardiovascular prevention program. *Int J Behav Med*. 2015 Jun;22(3):393-403.
39. Hardy S, Deane K, Gray R. The northampton physical health and wellbeing project: The views of patients with severe mental illness about their physical health check. *Ment Health Fam Med*. 2012 Dec;9(4):233-40.





Chapter 8

Design of generic selective cardiometabolic prevention programs in primary care: consensus development using the RAND/UCLA appropriateness method

Norbert Král, Anne-Karien M. de Waard, François G. Schellevis, Joke C. Korevaar, Christos Lionis, Axel C. Carlsson, Anders L. Sønderlund, Jens Søndergaard, Lars B. Larsen, Monika Hollander, Trine Thilsing, Agapi Angelaki, Niek J. de Wit, Bohumil Seifert

Submitted

Abstract

Background: Selective prevention of cardiometabolic diseases (CMD) – that is, preventive measures specifically targeting the high risk population – may represent the most effective approach for mitigating rising CMD rates.

Objective: To develop a generic construct of selective CMD prevention that can guide implementation within European primary care.

Methods: 32 statements covering different aspects of selective CMD prevention programs, based on a synthesis of evidence from two systematic literature reviews and surveys conducted within the SPIMEU project were identified. The Rand/UCLA Appropriateness method (RAM) was used to find consensus on these statements among an international expert panel. Before the consensus meeting statements were rated by the experts in a first round. In the next step during a face-to-face meeting, participants were provided with the results of the first rating and were then invited to discuss and rescore the statements in a second round.

Results: As a final outcome of the RAM procedure, 28 (90%) of 31 statements were considered appropriate and 3 (10%) were rated uncertain. One statement was deleted by the panel. Selective CMD prevention was considered an effective approach for preventing CMD and a proactive approach was regarded as more effective compared to case-finding alone. The most efficient method to systematically implement selective CMD prevention in primary care relies on a stepwise approach: initial risk assessment followed by interventions if indicated.

Conclusion: The final set of statements represents the characteristics of selective CMD prevention and can serve as a guide for implementing selective prevention actions in European primary care.

Introduction

Cardiometabolic disease (cardiovascular disease, diabetes mellitus, and chronic kidney disease; CMD) is a major public health issue worldwide. Apart from being a leading cause of death in most developed countries, CMD often results in significant decreases in quality of life for the patient, and considerable increases in associated health care costs.^{1,2} However, many CMDs are preventable through medical interventions targeting risk factors such as hypertension and hypercholesterolemia, and lifestyle modifications, such as increasing physical activity and quitting smoking.³ As such, population-based prevention programs may counter the onset and development of CMD.⁴

Several approaches for prevention are described in the literature.⁵ Selective prevention targets only those at higher than average risk.⁶ Selective prevention has shown promising results in preliminary research, but evidence about effectiveness from larger studies is lacking.⁷ The debate about the effectiveness of systematic versus opportunistic screening for cardiovascular disease (CVD) and diabetes mellitus is ongoing.⁸⁻¹⁰ In addition, there is much debate about the implementation of selective CMD prevention, with questions about the optimal setting, the preferred strategy and logistical approach for identification.

The most prominent challenge in selective prevention is how to efficiently identify persons at increased risk in the general population in order to start indicated prevention activities.^{11,12} Although primary care probably provides the best setting, several factors are presently impeding implementation in general practice. Selective CMD prevention has not yet been formally labelled as a key task for general practice¹³ there is no generally accepted construct of leading principles and key components for primary care based CMD prevention and an overview of barriers and factors that could impede or facilitate effective implementation is missing.

SPIMEU is a cross-European research project aiming to contribute to build capacity in relation to the prevention of cardiometabolic diseases in the EU member states by establishing the feasibility of an innovative approach to identify persons at high risk for cardiometabolic diseases (<http://www.spimeu.org>). Working towards that purpose, we gathered relevant information with regards to the present implementation status of selective cardiometabolic prevention programs across Europe, and identified hampering and success factors. A second objective of the SPIM program was to achieve consensus about key characteristics of selective CMD prevention in primary care.

Here we report the process and outcome of the expert based consensus procedure that we conducted to develop a generic construct for selective CMD prevention in primary care that can guide implementation across Europe.

Methods

Study design

To develop this construct, first a set of statements describing various aspects of the process of selective CMD prevention were developed. These statements were used as input for a consensus procedure among an international expert panel, using the Rand/UCLA Appropriateness methodology (RAM), resulting in a set of consensus statements describing the key characteristics of selective CMD prevention.

Statements

Statements have been formulated by the SPIMEU project team based on the literature, including a synthesis of evidence from two literature reviews of barriers and facilitators of selective cardiometabolic prevention among professionals¹⁴ and patients¹⁵ and the results of surveys among experts, health professionals and patients of the attitudes and practices of selective CMD prevention in the EU Member states.¹⁶

Selection of study subjects

The panel included seven academic general practitioners from five EU countries with experience in group consensus methodology, representatives of the SPIMEU Project Team, and seven internationally recognized professionals with specific expertise in CMD prevention; four epidemiologists, two cardiologists, and one researcher in the field.

Measurements and qualitative methods

A consensus procedure based on the Rand/UCLA Appropriateness methodology (RAM) has been utilized. RAM comprises an individual, first-round rating of a series of statements that explore the subject of interest, by members of the expert panel. Next, the panel engages in a facilitated group discussion about each statement and finally, panel members participate in a second round of rating, this time with the added knowledge from the group discussion.¹⁷

The draft statements (see above) were mailed to all participants at the end of January 2017 together with background information including a list of references relevant to selective CMD prevention, a summary of the literature reviews and of the survey results. Participants were invited to rate each statement on a 9-point Likert scale (1: completely disagree – 9: completely agree) and were advised to base their ratings rather on evidence than on personal opinion, and not to emphasize the local/country perspective.¹⁸

The panel met for a two day meeting in March 2017 to discuss the statements including the results of the first-round rating. Literature resources were available on-line and the discussion was audio-recorded. In situations where it became apparent that the formulation of statements was suboptimal for group judgement, the participants reformulated it in consensus. The discussion was concluded by a confidential re-rating.

Outcomes and analysis

The results of the second rating were analyzed; the level of agreement was analyzed for each statement and summarized. The statement was considered as appropriate when the median rating was between 7 and 9 and no rating was in the 1 to 3 point range. Uncertainty was reported when the median rating was between 4 and 6 points or any median with 3 ratings in the 1 to 3 score range and 3 ratings in the 7 to 9 score range.¹⁷ The final version of the statements was authorized by all participants (table 1).

Results

The 32 statements that were drafted by the project team covered the key aspects of selective CMD prevention divided over four domains: 1) Background, 2) Organization and Funding, 3) Target Group and Methods of Identification of Risk Groups, and 4) Provision of selective CMD prevention. Fourteen experts participated in the first rating round, 12 of them (86%) participated in the consensus meeting and in the second rating round. In the first round 12 (38%) out of 32 statements were found appropriate while 20 statements (62%) were rated as uncertain. During the meeting the participants reformulated a number of statements; some for linguistic and grammar reasons, others in order to increase their appropriateness. Statement 26 was deleted based on the panel decision that it duplicated Statement 20. After the second round of rating 28 (90%) out

of 31 statements were agreed upon as being appropriate and 3 (10%) were considered uncertain.

Discussion

We developed a construct for a selective CMD prevention program, rooted in 31 statements based on scientific literature that were adopted in a systematic consensus procedure.

During the consensus process eight of the 31 statements were extensively debated. **Statement 3:** Although the majority of incident cases of CMD occur in moderate and low risk individuals, general health checks offered to the entire population do not reduce all-cause or cardiovascular morbidity or mortality.⁸ Thus, targeting high-risk individuals rather than mass population screening is the preferred route.¹⁹ On the other hand, population-based risk assessment was found to be cost-effective when compared with no screening.²⁰ There has been diversity in the provision of prevention programs for CMD across Europe. In some (UK, the Czech Republic) organized programs have been established and people are actively being invited for prevention.²¹ In other countries a case-finding approach is used in general practice (Denmark). There is limited evidence, that a proactive approach (**Statement 4**) is effective in CMD prevention.^{6,9,22,23}

Statement 5 provoked a lot of discussion and was ultimately rated as uncertain. CMD and various cancers have a number of risk factors in common. Some conditions increase the risk of other, e.g. a CMD risk is associated with the risk of colorectal cancer.^{24,25} It is not clear whether the effectiveness of prevention programs disappears if programs are combined or strengthened if generic components of different preventive programs are taken together, although the evidence for the second option prevails. A strong patient preference for combining programs was detected in the SPIMEU patient surveys.¹⁵

The stepwise approach (**Statement 6**) was suggested in accordance with the Dutch guideline on Preventive Consultation, Cardiometabolic Risk Module.⁶ This stepwise approach includes an initial risk assessment to preselect people at risk of CMD (e.g. by a self-reported questionnaire), a subsequent consultation with a general practitioner to complete the risk profile and to propose tailored preventive interventions, if indicated. The formulation of statement⁶ was left general as it is, because there was no evidence which tool for the initial assessment is optimal and what strategy would fit in a specific health care setting.

The understanding of the word “to mandate” in **Statement**¹¹ is to give authority to health care organizers, health payers, scientific and professional organizations and health care providers to act in order to develop, fund and implement selective CMD prevention programs.

There was a clear agreement on the appropriateness of **Statement 13**, nevertheless the impact of European guidelines, such as joint ESC Guidelines,²⁶ on national guidelines for local adaptation was emphasized.

With regard to **Statement 14** and taking into account the European diversity, the panel unanimously perceived primary care as the “setting”, which does not always mean general practitioners.^{6,27}

Statement 22. Prevention of CMD is suggested to be important at any age. The negative cardiometabolic risk profile is shifting towards younger ages, therefore it seems appropriate to move the threshold to a lower age. The WHO suggests CMD prevention in age 35-65 in men respectively 45-75 in women. The ESC guidelines do not recommend systematic cardiovascular risk assessment in adults under 40 years of age with no known CV risk factor due to a low cost-effectiveness.²⁶ The Dutch Guideline recommends the use the questionnaire for the Preventive Consultation from the age 45 to 70.⁶ The SCORE risk assessment is applicable for age over 40.

Strengths and limitations

We believe that the composition of the expert panel with regard to professional background and country resulted in an adequate representation of expertise. The international composition of the group extends the validity of the statements to cultures and languages other than English. The most important limitation of the study is related to the subjective nature of the panel opinions, and the selection of panel members may, therefore, have influenced the outcomes. Other methods could be used to search for a consensus, but we consider the RAM to be the most suitable tool for combining the best available scientific evidence with the collective judgement of a panel of experts.

The strength of the RAM method is the structured and detailed discussion, though some strong personal opinions based on country experience may prevail. The discussion on generic aspects of CMD prevention might have been influenced by differences in health care systems and particularly their current focus on prevention. The RAM method is a well-established technique for synthesizing group judgements.¹⁷ We produced and explored rather a low

number of statements compared to hundreds or thousands in other studies. We finally agreed on the appropriateness of a high proportion of statements in comparison to other studies that used the RAM procedure. It might be due to the reformulation of some statements during discussion, but more probably it reflects the consensus on a need of actions to be taken in Europe towards CMD prevention.^{27,28} While aiming to prepare generic statements we could not go into details of some aspects of CMD prevention.

Relation to other research

Authorized guidelines for CMD prevention are available, but as far as we know, there is no generic construct of selective CMD prevention that can be locally adopted and implemented within European primary care.

Conclusions

The results of this study provide a generic fundament for the design of a stepwise model on selective CMD prevention, which should be further elaborated in tailored designs for the implementation in general practice in EU Member States. The sustainability of this guide should be periodically reviewed regularly and it can lead to the revision of the current knowledge.

Table 1. Table of statements



SPIM EU		Number	Statement	Median											
BACKGROUND	1.	Prevention of cardiometabolic disease is one of the most appropriate actions against this major health problem.	9	1	2	3	4	5	6	7	8	9	10	11	12
	2.	Effective interventions on a population level include the creation of a healthier and affordable environment (e.g. displaying food in supermarkets) and actions targeted at promoting a healthy lifestyle (e.g. using stairs instead of elevators).	9	1	2	3	4	5	6	7	8	9	10	11	12
	3.	Selective cardiometabolic prevention targets at those defined at high risk based on individual risk profile and represents an effective approach for preventing cardio-metabolic diseases.	8,5	1	2	3	4	5	6	7	8	9	10	11	12
	4.	Identifying and treating high-risk individuals using a pro-active approach is more effective than case-finding alone using the whole population approach.	9	1	2	3	4	5	6	7	8	9	10	11	12
	5.	Selective cardiometabolic prevention should be a separate prevention program not combined with other programs (for example cancer prevention).	5,5	1	2	3	4	5	6	7	8	9	10	11	12
	6.	The most efficient method to perform selective cardiometabolic prevention in primary care in a systematic way is through adoption of the stepwise approach: using initial risk assessment followed by interventions if indicated.	9	1	2	3	4	5	6	7	8	9	10	11	12
	7.	The generic step-wise approach for selective cardiometabolic prevention should be adapted nationally/regionally with respect to local conditions into national practical guidelines.	9	1	2	3	4	5	6	7	8	9	10	11	12
	8.	In programs on selective cardiometabolic prevention positive effect of worries of patients faroutweighs the negative effects.	8	1	2	3	4	5	6	7	8	9	10	11	12

Table 1. Continued



SPIM EU		MED										
	Number	Statement										
ORGANIZATION AND FUNDING	9.	EU Member States should have programs that focus on selective cardiometabolic prevention.	9	1	2	3	4	5	6	7	8	9
	10.	Programs on selective cardiometabolic prevention should be mandated on a national level.	9								1	10
	11.	Governments should be responsible for the implementation of policy on selective cardiometabolic prevention.	9								1	7
	12.	Costs for selective cardiometabolic prevention should be allocated and protected in regular health care financing.	9								2	10
	13.	Professional and scientific organizations in each EU country should be responsible for the development of the clinical practice guidelines on selective cardiometabolic prevention.	8								1	6
	14.	Selective cardiometabolic prevention should preferably be coordinated by primary care.	8								6	5
	15.	The effectiveness of a selective prevention program for cardiometabolic diseases heavily depends on the participation of the target group and their long-term adherence to interventions.	9								2	10
	16.	Selective cardiometabolic prevention programs should firstly be implemented as a pilot in each respective country and then tailored to the specific contexts that apply to that country.	9									3
	17.	The data on selective cardiometabolic prevention should be collected, to monitor and scientifically evaluate the program and allow for adjustments.	9									1
				1	2	3	4	5	6	7	8	9

SPIM EU		MED																		
Number Statement		8,5	9	9	8	8	5	5,5	9											
TARGET GROUP AND METHODS OF IDENTIFICATION OF RISK GROUP FOR SELECTIVE CARDIOMETABOLIC PREVENTION	18.	In order to efficiently identify individuals at high risk of developing cardiometabolic diseases, reliable and relevant data on individuals is required.																		
	19.	Patients treated for hypertension, diabetes mellitus, cardiovascular disease, chronic renal damage and/or hypercholesterolemia are by definition not a target group for selective cardiometabolic prevention.																		
	20.	The program should include a validated risk assessment tool for cardiometabolic diseases (CV disease, diabetes mellitus, chronic renal failure).																		
	21.	For the initial approach to patients with-in selective preventive cardiometabolic diseases programs optimal local options should be used (post, e-mail, call, internet, direct provision at practices).																		
	22.	The target population for selective cardiometabolic prevention should at least include individuals aged 40 – 70 years old.																		
	23.	Men and women should have the same risk assessment tool in selective cardiometabolic prevention.																		
	24.	Men and women should have the same intervention in selective cardiometabolic prevention.																		
25.	Risk score measures should be validated by each country based on national statistics of cardiometabolic diseases (if available).																			



Table 1. Continued



SPIM EU	Number	Statement	MED									
PROVISION OF SELECTIVE CARDIO-METABOLIC PREVENTION IN PRIMARY CARE	27.	During a consultation in a primary care an individualized intervention plan should be initiated based on the individual patients risk profile.	9	1	2	3	4	5	6	7	8	9
	28.	Each country should have training courses for primary care teams to deliver selective cardiometabolic prevention.	9	1	2	3	4	5	6	7	8	9
	29.	Certification and accreditation of this course could facilitate implementation of cardio-metabolic prevention.	8	1	2	3	4	5	6	7	8	9
	30.	Selective cardiometabolic prevention tasks should be performed by trained multidisciplinary teams in primary care.	9	1	2	3	4	5	6	7	8	9
	31.	For successful implementation of sustainable nationwide selective prevention of cardio-metabolic diseases support from all relevant stakeholders (i.e. national and local government, professional organizations, health care insurance companies and patients organizations), is essential.	9	1	2	3	4	5	6	7	8	9
	32.	All data on selective cardiometabolic prevention should be recorded in primary care in a structured and validated way to be available for later evaluation.	9	1	2	3	4	5	6	7	8	9

MED, Median

Acknowledgements

We would like to thank all panellists:

International experts: Matea Bulc, assoc. prof., MD, Ph.D. (Slovenia), Margareta Norberg assoc. prof., MD, Ph.D. (Sweden), Hanif Ismail, Ph.D. (UK), Roderik Kraijenhagen, MD, Ph.D. (the Netherlands), Janus Laust Thomsen, MD, Ph.D., Michal Vrablík, assoc. prof., MD, Ph.D. (Czech Republic), Arno W. Hoes, prof., MD, Ph.D. and Demosthenes Panagiotakos, MD, FACE, FRSPH (Greece).

SPIM Partner representatives: Christos Lionis, prof. MD, PhD, FRCGP(Hon) FESC, (Greece), Jens Søndergaard prof. MD, Ph.D. (Denmark), Axel C. Carlsson, MD, MSC, Ph.D. (Sweden), François G. Schellevis, prof., MD, Ph.D. (the Netherlands), Monika Hollander, MD, Ph.D. (the Netherlands), Norbert Král, MD, (Czech Republic)

Moderators: Niek J. de Wit, prof., MD, Ph.D., FRCPE (the Netherlands), Bohumil Seifert, assoc. prof., MD, Ph.D. (Czech Republic)

Members of SPIMEU project: Joke Korevaar prof. MD, Ph.D. (the Netherlands), Anne Karien de Waard, MD (the Netherlands), Lars Bruun Larsen, MD, Ph.D. (Denmark), Anders Sonderlund, MD, Ph.D. (Denmark), Agapi Angelaki, MD (Greece), Gerdien Dalmeijer, MD, Ph.D. (the Netherlands), Thrine Thilsing, MD, Ph.D. (Denmark), Björn Eriksson, MD, Ph.D. (Sweden), Mark M.J. Nielen, MD, Ph.D. (the Netherlands), Martin J. Holzmann, MD, Ph.D. (Sweden), Per E. Wändell, prof., MD, Ph.D. (Sweden) and Heidi Gram, project nurse (Denmark).

Author contributions

NK and BS contributed to conception, design and drafted the manuscript. FS, NdW, JK and JS contributed to conception, design, acquisition, analysis, interpretation and critically revised manuscript. AKW, CL, AC, AS, AA, MH and TT contributed to acquisition, analysis, interpretation and critically revised manuscript. LBL contributed to conception, design and critically revised manuscript.

Funding

The manuscript is part of the project / joint action '663309 / SPIM EU' which has received funding from the European Union's Health Programme (2014-2020).

References

1. Vaartjes I, Van Dis I, Visseren F, Bots M. Hart-en vaatziekten in Nederland [Cardiovascular disease in the Netherlands]. The Hague: Netherlands Heart Foundation. Hart-en vaatziekten in Nederland, 2009.
2. Gyberg V, Ryden L. Policymakers' perceptions of cardiovascular health in Europe. *Eur J Cardiovasc Prev Rehabil* 2011 Oct;18(5):745-753. doi: 10.1177/1741826710397487.
3. Baigent C, Keech A, Kearney PM, Blackwell L, Buck G, Pollicino C, et al. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. *Lancet* 2005 Oct 8;366(9493):1267-1278.
4. Lindgren P, Lindstrom J, Tuomilehto J, Uusitupa M, Peltonen M, Jonsson B, et al. Lifestyle intervention to prevent diabetes in men and women with impaired glucose tolerance is cost-effective. *Int J Technol Assess Health Care* 2007 Spring;23(2):177-183.
5. Gordon RS, Jr. An operational classification of disease prevention. *Public Health Rep* 1983;98(2):107-109.
6. Dekker JM, Alsema M, Janssen PGH, van der Paardt M, Festen CCS, van Oosterhout MJW, et al. The Prevention Consultation, Cardiometabolic Risk module. *Huisarts Wet* 2011;3:138-155.
7. Marshall T, Caley M, Hemming K, Gill P, Gale N, Jolly K. Mixed methods evaluation of targeted case finding for cardiovascular disease prevention using a stepped wedged cluster RCT. *BMC Public Health* 2012 Oct 26;12:908. doi: 10.1186/1471-2458-12-908.
8. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
9. Crossan C, Lord J, Ryan R, Nherera L, Marshall T. Cost effectiveness of case-finding strategies for primary prevention of cardiovascular disease: a modelling study. *Br J Gen Pract* 2017 Jan;67(654):e67-e77.
10. Feldman AL, Griffin SJ, Fharm E, Norberg M, Wennberg P, Weinehall L, et al. Screening for type 2 diabetes: do screen-detected cases fare better? *Diabetologia* 2017 Nov;60(11):2200-2209.
11. Badenbroek IF, Stol DM, Nielen MM, Hollander M, Kraaijenhagen RA, de Wit GA, et al. Design of the INTEGRATE study: effectiveness and cost-effectiveness of a cardiometabolic risk assessment and treatment program integrated in primary care. *BMC Fam Pract* 2014 May 9;15:90.
12. Nielen MM, Assendelft WJ, Drenthen AJ, van den Hombergh P, van Dis I, Schellevis FG. Primary prevention of cardio-metabolic diseases in general practice: a Dutch survey of attitudes and working methods of general practitioners. *Eur J Gen Pract* 2010 Sep;16(3):139-142.
13. Drenthen A, Assendelft W, Van der Velden J. Preventie in de huisartsenpraktijk: kom in beweging! *Huisarts wet*. 2008;51:38-41.

14. Wandell PE, de Waard AM, Holzmann MJ, Gornitzki C, Lionis C, de Wit N, et al. Barriers and facilitators among health professionals in primary care to prevention of cardiometabolic diseases: A systematic review. *Fam Pract* 2018 Jan 29. doi: 10.1093/fampra/cmz137.
15. de Waard AM, Wändell PE, Holzmann MJ, Korevaar JC, Hollander M, Gornitzki C, de Wit N, Schellevis FG, Lionis C, Søndergaard J, Seifert B, Carlssonon AC. Barriers and facilitators to participation in a health check for c cardiometabolic diseases in primary care: A systematic review. *Eur J Prev Cardiol*. 2018 Aug;25(12):1326-1340. doi: 10.1177/2047487318780751.
16. de Waard AKM, Hollander M, Korevaar JC, Nielen MMJ, Carlsson AC, Lionis C, et al. Selective prevention of cardiometabolic diseases: Activities and attitudes of general practitioners across Europe. *European Journal of Public Health*, 16 July 2018, cky112, <https://doi.org/10.1093/eurpub/cky112>
17. Fitch K, Bernstein SJ, Aguilar MD, Burnand B, LaCalle JR. The RAND/UCLA appropriateness method user's manual. 2001. Santa Monica, CA:RAND, Prepared for Directorate General XII, European Commission.
18. Brook RH. The RAND/UCLA appropriateness method. In: McCormick KA, Moore SR, Siegel RA (1994), *Methodology Perspectives*, AHCPR Pub. No. 95-0009, Rockville, MD: Public Health Service, U.S. Department of Health and Human Services, pp. 59-70.
19. Lawson KD, Fenwick EA, Pell AC, Pell JP. Comparison of mass and targeted screening strategies for cardiovascular risk: simulation of the effectiveness, cost-effectiveness and coverage using a cross-sectional survey of 3921 people. *Heart* 2010 Feb;96(3):208-212.
20. Wood D, Kinmonth A, Davies GA, Yarwood J, Thompson SG, Pyke SDM, et al. Randomised controlled trial evaluating cardiovascular screening and intervention in general practice: principal results of British family heart study. Family Heart Study Group. *BMJ* 1994 Jan 29;308(6924):313-320.
21. Forster AS, Burgess C, McDermott L, Wright AJ, Dodhia H, Conner M, et al. Enhanced invitation methods to increase uptake of NHS health checks: Study protocol for a randomized controlled trial. *Trials*. 2014/08;30(15):342.
22. Dyakova M, Shantikumar S, Colquitt JL, Drew CM, Sime M, MacIver J, et al. Systematic versus opportunistic risk assessment for the primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2016 Jan 29;(1):CD010411. doi(1):CD010411.
23. Brotons C, Bulc M, Sammut MR, Sheehan M, Manuel da Silva Martins C, Bjorkelund C, et al. Attitudes toward preventive services and lifestyle: the views of primary care patients in Europe. the EUROPREVIEW patient study. *Fam Pract* 2012 Apr;29 Suppl 1:i168-i176.
24. Carlsson AC, Wandell PE, Gigante B, Leander K, Hellenius ML, de Faire U. 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 Sep 30;168(2):946-952.

25. Peeters PJ, Bazelier MT, Leufkens HG, de Vries F, De Bruin ML. The risk of colorectal cancer in patients with type 2 diabetes: associations with treatment stage and obesity. *Diabetes Care* 2015 Mar;38(3):495-502.
26. 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). *European Heart Journal* 2016 August 1;37(29):2315-2381.
27. Lalonde L, Goudreau J, Hudon E, Lussier MT, Bareil C, Duhamel F, et al. Development of an interprofessional program for cardiovascular prevention in primary care: A participatory research approach. *SAGE Open Med* 2014 Feb 17;2:2050312114522788.
28. Garbi M, Habib G, Plein S, Neglia D, Kitsiou A, Donal E, et al. Appropriateness criteria for cardiovascular imaging use in clinical practice: a position statement of the ESC/EACVI taskforce. *Eur Heart J Cardiovasc Imaging* 2014 May;15(5):477-482.





Chapter 9

General discussion



Given the rise in the incidence of cardiometabolic diseases (CMD), the relevance to develop strategies to prevent these diseases is more actual than ever. Current implementation of selective prevention programmes for CMD is suboptimal and programmes are often not structurally embedded in health care. The positive attitude of both the population and general practitioners (GPs) towards selective prevention provides a promising starting point to further implement selective prevention programmes for CMD across Europe.

This final chapter discusses the main results of the studies described in this thesis, the interpretation of these findings, and provides recommendations for the future.

The main findings from our studies are:

- In almost two-thirds of the countries in the European Union (EU) a prevention programme is available. In most programmes, professionals from primary health care and/or public health are involved. Prevention programmes are more frequently present in countries with a strong primary care system than in countries with a weak primary care system (chapter 2).
- Although most GPs consider selective CMD prevention as useful, it is not universally implemented, with differences in GPs' activities between and within countries (chapter 3). Country specific health care related contextual factors more than GPs' characteristics seem to determine GPs' involvement in actively approaching patients for a CMD risk assessment (chapter 4).
- There are several facilitating and obstructing factors for GPs to undertake selective prevention of CMD. The most frequently reported facilitators we identified were a positive attitude towards prevention in general, feasible and effective interventions, availability of support within the practice, and sufficient training and education. Lack of time and insufficient reimbursement turned out to be barriers (chapter 5).
- Most individuals are willing to participate in a CMD health check and the majority considers general practice as the preferred supply setting of prevention programmes (chapter 6).

- Facilitating factors for individuals to participate in a health check were positive attitudes such as wanting to know their CMD risk, feeling responsible for, and having concerns about one's own health, and easy access to appointments. Barriers were younger age, smoking, low education, and negative attitudes such as worries about the outcome, low perceived severity and susceptibility, and a negative attitude towards health checks and prevention. To maximise the uptake of health checks they need to be tailored to the national health care context, with special attention for individuals who are more difficult to reach (chapter 7).
- There is wide consensus among primary and secondary care experts about key features and characteristics of prevention programmes. The consensus document which resulted from the expert meeting could act as a basis for broad implementation of selective CMD prevention programmes across Europe (chapter 8).

Based on these findings we conclude that different activities are going on across Europe within the field of selective prevention of CMD, and that there is broad support for CMD prevention on population and professional level. However, for structural implementation throughout Europe a firm policy is required.

As stated in the introduction of this thesis, there are several challenges associated with the implementation of prevention programmes. These challenges include: who should implement selective prevention of CMD, what is the target population and how to involve them in selective prevention and how to adequately facilitate selective prevention of CMD in the health care system? Tackling these challenges is conditional for optimal facilitating of selective prevention of CMD across Europe. We will now discuss these challenges, taking the results of the studies in this thesis into account.

Who should implement selective prevention of CMD?

The involvement of GPs in selective prevention of CMD

GPs have a positive attitude towards primary prevention of CMD and GPs believe they should advise on preventive and health promotion activities. Also the population considers the GP as the preferred provider, and experts during our consensus meeting agreed that 'selective CMD prevention should preferably be coordinated by primary care'. However, we identified a big gap between the

positive attitude of GPs and their actual activities to actively invite individuals for a CMD risk assessment. Apparently a positive attitude and willingness to perform these tasks are not enough to actually do it, and barriers exist to actually implement selective prevention of CMD in general practice.

Barriers and facilitators for the implementation of selective prevention in general practice

To involve GPs in selective prevention, it is important to optimise the conditions and diminish the barriers as much as possible. In our systematic literature review, we identified several barriers and facilitators for GPs to perform selective prevention of CMD. We will now discuss three of these factors in more detail.

Lack of time

One of the barriers we identified was lack of time. GPs already experience a high workload, and in 76% of the general practices across the EU workload is found to be unreasonably high and unsustainable given future challenges.¹ To motivate GPs to implement prevention programmes it is important to enable them to reserve dedicated time to execute these tasks. Options to achieve this are for example to decrease the number of listed patients per practice, increase the length of consultations or provide auxiliary staff. Regarding the latter, practice nurses could be employed who primarily focus on the organisation and execution of preventive tasks. Furthermore, the responsibilities for selective prevention of CMD could be shared with other health care providers. For example in a current Danish prevention project individuals at risk of CMD are referred to either the GP or to a municipal health center depending on their level of risk.² By referring individuals at lower risk for CMD to non-curative health care providers the pressure on GPs will decrease.

Inadequate reimbursement

Lack of reimbursement is another important barrier for GPs to implement a prevention programme in their practice. Adequate reimbursement is therefore important to motivate GPs to perform activities in the field of selective prevention of CMD. For instance in the Czech Republic, one of the success factors of the national prevention programme is the fact that it is fully reimbursed for the population and that it provides an important source of income for GPs. We found that the participation of GPs in selective prevention was the highest in the Czech

Republic; 69% actively invite their patients. This was considerably higher than in the other four countries (average around 40%). This suggests that financial incentives do stimulate GPs' participation in selective prevention.

One of the difficulties for the reimbursement of preventive activities is that there is no short term reciprocity (return on investment). This means that the one who is paying for the preventive activities does not have an instant and short term advantage of this investment. This might lead to hesitation from for example health care insurance companies to invest in prevention. On the long term, however, a decrease in risk factors leads to a decrease in morbidity, and related health care costs due to for example hospitalisations. These long-term benefits should convince potential funders to invest in CMD prevention.

Inadequate scientific evidence

Another barrier for GPs to implement prevention programmes is the scarce and inconsistent available scientific evidence for their effectiveness. A Cochrane review from 2012 concluded that 'health checks' had no effect on CVD related morbidity and mortality³ and a study on community based screening and lifestyle counselling did not show an effect on the incidence of ischemic heart disease, stroke or mortality on population level.⁴ On the other hand, a review on the effectiveness of general practice based health checks did show improvement of surrogate outcomes such as blood pressure, body mass index (BMI) and total cholesterol, especially among high-risk individuals.⁵ Also, a community and primary care-based screening and intervention programme did demonstrate to decrease blood pressure, glucose levels and smoking rates.⁶ Thus, there is ongoing debate on the effectiveness of selective prevention programmes for CMD. The lack of evidence on the effectiveness of these programmes might be a reason for GPs to not implement them. Future evidence could stimulate the inclusion of these programmes in clinical practice guidelines, which would encourage GPs to implement these programmes in their practices.

Two large studies are currently ongoing that assess the (cost-) effectiveness of selective prevention programmes for CMD in primary care. In the **Integrate** study, a population based stepped-wedge randomized controlled trial (RCT) in the Netherlands, enlisted patients from participating general practices without CMD between 45-70 years are invited to participate in an online risk estimation. Individuals with a score above a certain threshold are advised to visit their GP for additional measurements and tailored treatment through lifestyle counselling or

medication.⁷ In the Danish TOF study individuals aged 39-59 years are invited for completing an online questionnaire. Based on the risk profile three risk groups are distinguished: the group at highest risk is referred to the GP, the moderate risk group to the municipalities and the group at lowest risk does not receive further examinations or follow up.⁸ The results of these studies will be available in the coming years.

In conclusion, GPs are in a unique position to play an important role in selective prevention programmes for CMD. Structural measures are needed to tackle barriers that hamper the actual implementation of prevention programmes in general practice such as lack of time, insufficient reimbursement and inconclusive scientific evidence.

What is the optimal target population for selective CMD prevention?

The decision on the definition of the target population for selective prevention for CMD is, in essence, based on cost-effectiveness arguments. Using broader criteria results in inviting more individuals and identifying more people as high risk, at a lower risk of missing high risk individuals. Using tighter criteria is more cost-effective and less time consuming, but there is a greater risk of missing individuals at risk.

Age cut-off point

One of the frequently used criteria to define the target population is age. Based on the results of the studies in this thesis, no uniform age range for the target population for prevention programmes could be identified. For example in the Czech Republic individuals above the age of 19 are being invited for the prevention programme, but in Lithuania men above 40 and women above 50 are invited, which is in line with the ESC guideline. However, this recommendation has been based on a level IIb recommendation, which means that the underlying evidence is conflicting. During the SPIM consensus meeting (Chapter 7) experts agreed to at least include the population between 40-70 years. This was consistent with the median recommended age range according to the GPs who completed the questionnaire in our survey. Future research on the optimal age range to achieve maximal health gain at acceptable financial investment is needed to be able to define the optimal target population.

Country specific risk calculation

CMD risk depends on several factors, such as age, genetic factors, diet, physical activity, cultural factors, socioeconomic status and gender. These factors differ between countries thus CMD risk also differs between countries.⁹ Currently, many countries already use a risk score adapted to their country specific situation, for example the Hellenic SCORE in Greece, and the Danish SCORE in Denmark. The optimal target population for selective prevention programmes for CMD might therefore be country specific. For example when the life expectancy in a country is high, the upper age limit could be raised, since there are many years to gain. On the other hand, when people at a young age already suffer from CMD risk factors the lower limit could be set at a lower age. At this moment no information is available on the optimal and most efficient target population, with the best balance between efficiency and screening yield in different countries. Country specific information on this topic is therefore needed to define the optimal target population.

Step-wise approach and time interval

Another method to improve efficiency is using a step-wise approach. This approach consists of a first crude risk assessment for example using a short online questionnaire to identify individuals above a certain risk threshold. Next, only the high-risk individuals are invited for the next step, which includes a visit to the GP for a more extensive risk assessment and laboratory tests. This step-wise approach is more efficient in terms of time and costs than a non-step-wise approach, since only a part of the individuals is invited for the complete risk assessment. However, a disadvantage of this stepwise approach is that in each step there is a chance that people drop-out, which was indeed the case in a Dutch pilot study evaluating the 'prevention consultation'.¹⁰

Another factor that might influence the uptake and efficiency of health checks is the time interval between two health checks. A larger interval requires less time investment from the health care providers as well as the population and costs less money, but a smaller time interval has the advantage that high risk individuals can be identified sooner. To our knowledge, the evidence on the optimal time interval between health checks, taking the evolution of CMD risk in individuals into account, is scarce or even non-existent.

In conclusion, a balance needs to be found between efficiency of prevention programmes and the risk for missing individuals at risk.

How to involve the target population in selective prevention programmes for CMD

Positive attitude

Our results show that individuals visiting general practices in the Czech Republic, Denmark, Greece, the Netherlands and Sweden already have a positive opinion towards participation in a health check for CMD and the majority (91%) is willing to participate. This provides a promising starting point for the implementation of selective prevention of CMD across Europe. However, according to the literature, the actual participation rate in health checks is substantially lower. In the studies included in our review, the attendance rate for health checks ranged from 1,2% to 84%, so in all studies this was lower than the 91% indicating to be willing to participate. Even in a country such as the Czech Republic with a national programme which is fully reimbursed for the population, the uptake is only around 30-40% [personal communication]. More insight in the barriers and facilitators for participation could help to diminish the gap between the willingness to participate and the actual participation.

Barriers and facilitators to participation

In our review we identified several barriers for individuals to actually participate in health checks for CMD. Practical reasons, for example lack of time, not receiving the invitation and difficulties with making an appointment were barriers. Smoking and low education were other factors related to non-participation. One of the concerns with the high-risk approach used in selective prevention is that it widens health inequalities. Diminished participation of smokers and individuals with a low education would indeed widen health inequalities, since these factors are both risk factors for CMD. One of the methods to tackle some barriers is the use of an opportunistic approach; i.e. doing health checks when people are already visiting the practice. As the majority of the patients visit their GP at least once a year, and those with a low socioeconomic status even more frequently, in this way the target population is reached and the risk of health inequalities reduced. Embedding CMD risk assessment in a broader health check

The majority of the population surveyed preferred a combined health check with other diseases such as cancer and depression. Combining the screening for different diseases in one health check might increase the uptake since people receive more information in the same visit and have to visit the practice only

once to screen for several diseases. However, expanding the scope of the consultation to several diseases requires more time investment. This would be logistically more difficult to implement in general practices, especially when an opportunistic approach is used. Another issue is that a health check for multiple diseases is only possible when the target population for screening is overlapping (e.g. the same age range). During the consensus meeting, no agreement was reached on the statement whether selective prevention programmes for CMD should be incorporated in a broader health check. Further exploration of this option is needed to clarify whether a combined health check is a desirable and achievable option.

Other barriers

We also identified psychological barriers for participation among the population such as not wanting to know the outcome of the risk assessment, low perceived severity of their risk and susceptibility for CMD, and a negative attitude towards prevention. These barriers are difficult to influence and differ between individuals. On the other hand, easy access to appointments, a positive attitude towards prevention and feeling responsible for one's own health were facilitators. Providing clear information on what the health check entails, as well as more knowledge on risk factors, their consequences and the options for interventions could be options to tackle these barriers. This will also provide the opportunity for individuals to make a well informed choice on participation or not.

A striking finding in this thesis is that the majority of the individuals is willing to pay for a health check. Costs for a health check were also rarely identified as a barrier in the literature. This provides the opportunity to ask for a (small) financial contribution from individuals participating in the health check, thus increasing commitment. However, this could also widen health inequalities, since individuals with a low income might be less willing to pay.

Prevention of CMD in general is a societal responsibility, and requires community and political initiatives on a wider scale. For successful CMD prevention it is important that also outside health care initiatives are started to decrease CMD risk. Examples are providing healthier food by the food industry for example by lowering sugar and fat in their products, motivating the population to be physically active, easy access to sport facilities and creating an environment that simulates an active life style, such as by constructing cycling paths. Finally, individuals should be encouraged to take the responsibility for

their own health. Optimal conditions, such as sufficient and comprehensive information, the option to get your health checked and a healthier environment could be provided by the government, municipalities, health care providers and other parties. But in the end it is the individual who makes the choice to improve his or her own health.

How to adequately facilitate selective prevention programmes for CMD in the future

For adequate facilitation of selective prevention of CMD in the health care system two essential steps are needed: formalising the GPs' role and securing funding.

Formalising GPs' role in prevention

As described in this thesis GPs are considered as the key professionals in CMD prevention. However, experienced barriers are only partly within the GPs' control. For successful implementation of selective prevention in general practice, changes in professional approach, collaboration and health care infrastructure are needed.

Historically, the role of the GP has been reactive, meaning that actions are taken when the patient visits the doctor with complaints. Active involvement of GPs in selective prevention asks for a paradigm shift from reactive towards a more pro-active approach. The European action plan of the World Health Organisation (WHO) on the strategy for prevention of non-communicable diseases (NCDs) recommends strengthening the role of primary health care in the prevention of NCDs, particularly in relation to risk factor assessment and management.¹¹ In some countries the role of GPs in prevention has already been documented. For example in Australia, multiple guidelines for preventive activities in different age groups exist for GPs,¹² accompanied by suggestions on how to implement these guidelines in practice.¹³

A firm position statement on an active role of GPs in selective prevention, both by professional bodies as well as policymakers, is conditional for implementing prevention programmes in general practice. Incorporating teaching on prevention for GPs in for example the training for GPs could also help to strengthen the role of GPs in prevention. In addition, multidisciplinary collaboration for the implementation of selective prevention of CMD is essential. For example nurses, dieticians, physiotherapists and community health staff play an important role,

especially in the second step of selective prevention: interventions to reduce the CMD risk, especially the lifestyle interventions.

Securing adequate funding

For long-term successful prevention programmes, adequate and sustainable funding is essential. However, no solid evidence for the economic benefit of prevention programmes is currently available,¹⁴ which might refrain funding bodies to provide structured funding for selective prevention programmes for CMD.

Countries differ in the reimbursement of primary health care; some countries have a fee for service system, whereas other countries have a system based on capitation, salary or a combination. Furthermore, allocation of funding can be arranged on different levels. Some countries, such as the Czech Republic have a national insurance system, with allocation of funding on national level, and in other countries such as Sweden the county councils allocate the funding for health care. Arrangement of adequate funding for selective preventive activities therefore requires a different approach per country.

Successful implementation of selective CMD requires a firm pan European initiative and political support

So far, we have discussed the challenges on the level of the health care provider, the target population and the health care system that arise within the field of selective prevention of CMD, and proposed several options to facilitate the implementation of selective prevention of CMD. However, for successful and structural implementation across Europe, the support of the European Union is essential.

Whilst selective prevention of CMD is a promising strategy to decrease the burden of CMD, the actual implementation in Europe is scattered and suboptimal. The positive attitude of the population and professionals, as well as the consensus among experts about organisation of selective prevention of CMD provide a good starting point for structural implementation of CMD prevention across Europe. However, given the complexity and challenges ahead a solid strategy and political support is required.

The role of the European Union in selective prevention

Given the heterogeneity between countries, a generic, one-size-fits-all model for the design and implementation of selective prevention of CMD, may be impractical, if not impossible in a European context. However, the European Union could play an important role in emphasizing the importance and stimulating the implementation of prevention programmes. After the position statement of the European parliament on the need for national colorectal cancer screening programmes, the number of programmes across Europe drastically increased.¹⁵ A comparable recommendation would boost the implementation of prevention programmes for CMD.

One of the other prerequisites for successful implementation across Europe is the evidence on the (cost-) effectiveness of prevention programmes. The EU therefore needs to invest in research on how to optimally organise selective prevention programmes for CMD in each country. Furthermore, the EU could play a role in monitoring the programmes and their effectiveness. If done on European level, this provides the opportunity for countries to compare their results, and to learn from strategies used in other countries.

Implications for further research

Currently, several questions remain to determine the most efficient way of organising selective prevention programmes for CMD. First, the optimal target population needs to be further studied and the minimal and maximal age to achieve the biggest health gain compared to the costs need to be defined. Research could also focus on methods to optimise the uptake of the population of CMD health checks. For example a study comparing an opportunistic with an active approach, or using a step-wise approach would give more insight in the actual uptake when using these different methods.

Further, the optimal organisation of CMD prevention in general practice needs to be studied: the optimal way to implement prevention programmes in their practice, the role of task delegation and the use of digital tools in prevention programmes. For example reminders on the smartphone to remind individuals to complete their health check could be used to increase the uptake. For GPs it can be very helpful if automatic invitations are sent, or if reminders pop-up in the electronic patient record if an individual did not have had a health check yet. On the health care level it is unclear which funding strategies are optimal. For example is the uptake lower when the population has to pay for a health check?

And what should be the reimbursement for GPs to motivate them to perform tasks in selective prevention? More insight in different reimbursement strategies would help to find the optimal financing system for selective prevention in each country.

Cost effectiveness studies are conditional to arrange adequate funding. Given the differences between countries such as CMD risk, cultural differences, the role of GPs in the health care system, and healthcare funding and spending, it is also very likely that the (cost-) effectiveness differs between one country and another.

Conclusion

The results in this thesis showed that in almost two-third of the countries in the EU a selective prevention programme for CMD is available. GPs and the population have a positive attitude towards selective prevention of CMD, but several challenges for implementation of selective prevention of CMD arise on the level of the health care provider, the population and the health care system. For successful implementation of selective prevention in general practice, changes on all these levels are essential.

On the level of the health care provider, GPs have an important role in selective prevention of CMD, which asks for a formalisation of the role of GPs, adequate reimbursement and time to perform preventive activities. Good collaboration and task delegation could support the role of GPs. Furthermore, it is important that GPs take the responsibility to implement prevention programmes, and partly change their focus from a curative perspective towards a prevention perspective.

On the level of the population the optimal target population should be defined, as well as an optimal method to invite the target population for selective prevention programmes for CMD. The success of a prevention programme highly depends on the participation of the population. Therefore it is important that individuals participate and adhere to the recommended lifestyle changes and take their medication. This asks for a positive attitude of the population, which is based on prevention rather than cure.

These factors are only partly within the GPs' and the populations' control, they also arise on the level of the health care organisation, resources and the policy level. A focus on prevention and the political willingness to invest and structurally fund prevention activities is thereby important. These measures would contribute to decrease the burden of morbidity and mortality of CMD, as well as other NCDs with overlapping risk factors. The EU could play an

important role by making prevention programmes for CMD a political priority across Europe. Further research should focus on how to best implement selective prevention programmes for CMD in the different countries, in relation to their cost-effectiveness.

References

1. McCarthy M. Sustainable general practice: looking across Europe. *Br J Gen Pract* 2016 Jan;66(642):36.
2. Larsen LB, Sonderlund AL, Sondergaard J, Thomsen JL, Halling A, Hvidt NC, et al. Targeted prevention in primary care aimed at lifestyle-related diseases: a study protocol for a non-randomised pilot study. *BMC Fam Pract* 2018 Jul 21;19(1):124-018-0820-8.
3. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev* 2012 Oct 17;10:CD009009.
4. Jorgensen T, Jacobsen RK, Toft U, Aadahl M, Glumer C, Pisinger C. Effect of screening and lifestyle counselling on incidence of ischaemic heart disease in general population: Inter99 randomised trial. *BMJ* 2014 Jun 9;348:g3617.
5. Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: A systematic review and meta-analysis. *Br J Gen Pract* 2014 2014/01;64(618):e47; e53.
6. Eliasson M, Eriksson M, Lundqvist R, Wennberg P, Soderberg S. Comparison of trends in cardiovascular risk factors between two regions with and without a community and primary care prevention programme. *Eur J Prev Cardiol* 2018.
7. Badenbroek IF, Stol DM, Nielen MM, Hollander M, Kraaijenhagen RA, de Wit GA, et al. Design of the INTEGRATE study: effectiveness and cost-effectiveness of a cardiometabolic risk assessment and treatment program integrated in primary care. *BMC Fam Pract* 2014 2014;15:90.
8. Bruun Larsen L, Soendergaard J, Halling A, Thilsing T, Thomsen JL. A novel approach to population-based risk stratification, comprising individualized lifestyle intervention in Danish general practice to prevent chronic diseases: Results from a feasibility study. *Health Informatics J* 2017 Dec;23(4):249-259.
9. Atlas Writing Group, Timmis A, Townsend N, Gale C, Grobbee R, Maniadakis N, et al. European Society of Cardiology: Cardiovascular Disease Statistics 2017. *Eur Heart J* 2018 Feb 14;39(7):508-579.
10. Van der Meer V, Nielen MM, Drenthen AJ, Van Vliet M, Assendelft WJ, Schellevis FG. Cardiometabolic prevention consultation in the Netherlands: screening uptake and detection of cardiometabolic risk factors and diseases--a pilot study. *BMC Fam Pract* 2013 ;14:29.
11. WHO regional office for Europe. Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. 2012; Available at: <http://www.euro.who.int/en/publications/abstracts/action-plan-for-implementation-of-the-european-strategy-for-the-prevention-and-control-of-noncommunicable-diseases-20122016>. Accessed 07/04, 2018.

12. The Royal Australian College of General Practitioners. Guidelines for preventive activities in general practice. 9th edn. East Melbourne. 2016; Available at: <https://www.racgp.org.au/your-practice/guidelines/redbook/>. Accessed 07/04, 2018.
13. The Royal Australian College of General Practitioners. Putting prevention into practice: Guidelines for the implementation of prevention in the general practice setting. 3rd edn. 2018; Available at: <https://www.racgp.org.au/download/Documents/Guidelines/Greenbook/RACGP-Green-book-3rd-edition.pdf>. Accessed 07/27, 2018.
14. Hiligsmann M, Wyers CE, Mayer S, Evers SM, Ruwaard D. A systematic review of economic evaluations of screening programmes for cardiometabolic diseases. *Eur J Public Health* 2017 Aug 1;27(4):621-631.
15. European Colorectal Cancer Screening Guidelines Working Group, von Karsa L, Patnick J, Segnan N, Atkin W, Halloran S, et al. European guidelines for quality assurance in colorectal cancer screening and diagnosis: overview and introduction to the full supplement publication. *Endoscopy* 2013;45(1):51-59.



Summary



Cardiometabolic diseases (CMD) including cardiovascular disease, diabetes mellitus and chronic renal failure are the number one cause of death worldwide. CMD are mainly caused by an unhealthy lifestyle with physical inactivity, smoking and an unhealthy diet as most important risk factors. There is abundant evidence that reducing CMD risk factors reduces CMD related morbidity and mortality. Considering the fact that CMDs are often preventable, preventive strategies are urgently needed. Selective prevention of CMD is a strategy on individual level, which entails the identification of presently asymptomatic individuals at high risk of CMD followed by interventions to lower their risk. If individuals at high risk of CMD could be identified efficiently within the population, targeted interventions can be started to decrease their risk and prevent CMD.

To accomplish successful implementation of selective prevention of CMD, is it essential to tackle the major challenges that currently arise in clinical practice across Europe: Who should implement selective prevention of CMD, what is the target population and how to involve them in selective prevention of CMD and how to optimally facilitate selective prevention of CMD in the health care system? Currently it is unknown if and how selective prevention of CMD is implemented in different countries across Europe. More insight into current practice in different countries would help to identify best practices, as well as barriers and facilitators for selective prevention of CMD. This provides the opportunity for countries to learn from each other's experiences and to give recommendations on how to optimise CMD prevention across Europe.

The research objectives of this thesis were:

1. On health system level: To provide information on the current status of the implementation of health checks for CMD across Europe and on conditions to facilitate the implementation;
2. On health care provider level: To give more insight into the current activities and barriers and facilitators for GPs to invite their patients for a CMD health check, as well as their attitude towards selective prevention of CMD;
3. On population level: To examine the willingness of the target population to participate in a health check for CMD as well as barriers and facilitators for participation.

To get a better insight into contextual factors, we studied five countries in more detail: the Czech Republic, Denmark, Greece, the Netherlands and Sweden.

1. Health system

To provide an overview of the current status of selective prevention of CMD across Europe, we performed a survey among experts in all EU member states. In total we identified 19 selective prevention programmes in 16 out of 28 countries. In most programmes, professionals from both primary health care and/or public health were involved. Prevention programmes were more frequently present in countries with a strong primary care system than in countries with a weak primary care system. Based on the scattered patterns, we could not identify a single “best practice” of policy making, programme development or execution within the currently existing programmes. Apparently, there is neither a “one size fits all” way nor a “sine qua non” for organising selective CMD prevention programmes. These findings indicate that in each health care system, CMD prevention programmes are feasible and that it is important to customise the (organisation of the) programme to the national context (chapter 2).

2. Health care provider

For various reasons, general practice could be the optimal setting for implementation of selective prevention; in most countries, general practitioners (GPs) have a longstanding and continuous relationship with their patients and they are up to date with their medical history. Furthermore, GPs are in the position to explain CMD risk, to refer to lifestyle treatment and to prescribe medication if indicated. To study GPs’ attitudes and activities in selective prevention of CMD, we performed a survey among GPs in five countries: the Czech Republic, Denmark, Greece, the Netherlands and Sweden. In total 575 questionnaires were analysed.

Although most GPs consider selective CMD prevention as useful, it is not universally implemented, with differences in GPs’ activities between and within countries. Some GPs used an active approach (47%) while others used an opportunistic approach (53%) to invite individuals for a risk assessment, but these values differed between countries. Most GPs considered selective CMD prevention as useful (82%) and saw it as part of their normal duties (84%). Most GPs had a disease management programme for individuals with risk factor(s) for cardiovascular disease (71%) or diabetes (86%). We conclude that

although most GPs considered selective CMD prevention as useful, it was not universally implemented. It is important to tailor implementation of selective CMD prevention in primary care to the national context, involving stakeholders at different levels (chapter 3).

We performed additional analyses on 496 complete questionnaires to study GPs' characteristics related with a pro-active approach of GPs to invite their patients for a risk assessment. We conclude that the country specific health care context and not GPs' characteristics determined their involvement in actively approaching patients for a CMD risk assessment (chapter 4).

In a systematic literature review we aimed to identify potential facilitators and barriers for health care professionals to undertake selective prevention of cardiometabolic diseases (CMD) in primary health care. Out of 19 studies we extracted the most frequently reported barriers and facilitators. Structural barriers were for example time restraints, insufficient reimbursement and problems with guidelines; facilitators were feasible and effective interventions, sufficient support and adequate referral possibilities. Organisational barriers were for example organisational problems, insufficient IT support, lack of support services and lack of suitable appointment times; facilitators were sufficient IT, logistic and practical support and cooperation with allied health staff. Professional barriers were for example insufficient counselling and skills and lack of knowledge and experience; sufficient training was a facilitator. An example of a patient-related barrier was low adherence of patients; a facilitator was a strong GP-patient relationship. Furthermore, a negative attitude towards prevention was a barrier whereas positive attitudes and considering prevention important were facilitators. 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. We suggest that before initiating selective prevention activities, local factors should be studied to tailor the intervention to the intended setting (chapter 5).

3. Population

For successful results, participation of the target population in health checks is vital. We aimed to identify factors related to unwillingness to participate in CMD health checks across the five 'focus' countries. We distributed a questionnaire among individuals without known CMD consulting in general practice. In total 1,354 persons responded. Nine percent was unwilling to participate in a CMD

health check. Male gender, smoking, higher self-rated health, never been invited before for a health check and not willing to pay for a health check were related to being unwilling to participate. The most frequent reason mentioned for unwillingness to participate was 'I think that I am healthy' (57%). Among the respondents who were willing to participate, 94% preferred an invitation by the general practitioner and 66% was willing to pay for a health check. The two most important reasons for willingness to participate were: 'I am curious to know my risk of cardiovascular disease / diabetes' (74 %,) and 'I want to be healthier' (40%). We conclude that the minority of the respondents in all five countries was unwilling to participate in a CMD health check. The majority considered general practice as the preferred supply setting. Together this provides a promising starting point to improve participation rates in CMD health checks in primary care (chapter 6).

To improve the uptake of health checks in primary care, we need to know what barriers and facilitators determine people's participation. We performed a systematic literature review and identified 39 studies from which barriers and facilitators were extracted. Facilitators for participation were attitudes such as wanting to know their cardiometabolic disease risk, feeling responsible for, and concerns about one's own health. Barriers were younger age, smoking, low education and attitudes such as not wanting to be, or being worried about the outcome, low perceived severity or susceptibility, and negative attitude towards health checks or prevention. Furthermore, practical issues such as the availability of information and the ease of access to appointments could influence participation.

We conclude that barriers and facilitators for participation in health checks for cardiometabolic diseases are heterogeneous. Hence, it is not possible to develop a "one size fits all" approach to maximise the uptake. For optimal implementation we suggest a multifactorial approach adapted to the national context with special attention for population subgroups that are more difficult to reach, such as those with a lower social economic status and immigrants (chapter 7).

In chapter 8 the results of the previous studies were used to develop 32 statements which can serve as a guide for implementing selective prevention programmes for CMD across Europe. A high rate of consensus among experts could be reached about several key features and characteristics. In general, selective CMD prevention was considered an effective approach for preventing

CMD and a proactive approach was regarded as more effective compared to case-finding alone. Primary care was regarded as the most preferred setting for selective prevention of CMD.

In **chapter 9** we discussed the main findings of this thesis and elaborated on future directions. We conclude that despite the positive attitude of GPs and the population, several challenges on the level of the health care provider, the population as well as the health care organisation level remain. For successful implementation of selective prevention in general practice, a change in the organisational infrastructure is therefore essential. A focus on prevention among policy makers and the political willingness to invest and structurally fund prevention activities is important. The EU could play an important role by making prevention programmes for CMD a political priority across Europe. Given the inconsistent evidence on the (cost-) effectiveness, further research should focus on how to best implement selective prevention programmes for CMD in different countries.





The page features decorative leaf graphics in the corners. In the top right corner, there is a cluster of dark, solid black leaves. In the bottom left corner, there is a cluster of light grey, semi-transparent leaves. The central text is positioned between these two clusters.

Nederlandse samenvatting

Cardiometabole aandoeningen, waaronder hart- en vaatziekten, diabetes mellitus en chronisch nierfalen zijn wereldwijd de belangrijkste doodsoorzaak. Cardiometabole aandoeningen worden voornamelijk veroorzaakt door een ongezonde leefstijl met lichamelijke inactiviteit, roken en een ongezond voedingspatroon als belangrijkste risicofactoren. Er is veel bewijs dat het verminderen van risicofactoren voor cardiometabole aandoeningen de morbiditeit en mortaliteit vermindert. Gezien het feit dat cardiometabole aandoeningen vaak voorkomen kunnen worden, is preventie dringend nodig. Selectieve preventie van cardiometabole aandoeningen is een strategie op individueel niveau, met allereerst de identificatie van asymptomatische individuen met een hoog risico op cardiometabole aandoeningen, gevolgd door interventies om hun risico te verlagen. Als individuen met een hoog risico op cardiometabole aandoeningen efficiënt kunnen worden geïdentificeerd binnen de algemene bevolking, kunnen gerichte interventies worden gestart om hun risico te verlagen en om cardiometabole aandoeningen te voorkomen.

Om succesvolle implementatie van selectieve preventie van cardiometabole aandoeningen tot stand te brengen, is het van groot belang om de vragen die zich momenteel in veel Europese landen opwerpen te beantwoorden: wie moet selectieve preventie van cardiometabole aandoeningen implementeren, wat is de doelgroep en hoe betrek je hen erbij, en hoe kan selectieve preventie van cardiometabole aandoeningen in het gezondheidszorgsysteem optimaal worden gefaciliteerd?

Momenteel is het onbekend of en hoe selectieve preventie is geïmplementeerd in verschillende landen in Europa. Meer inzicht in de huidige stand van zaken in verschillende landen kan helpen om 'best practices' te identificeren, evenals belemmerende en bevorderende factoren voor selectieve preventie van cardiometabole aandoeningen. Dit biedt de mogelijkheid voor landen om van elkaars ervaringen te leren en om aanbevelingen te doen over het optimaliseren van cardiometabole preventie in heel Europa.

De doelstellingen van dit proefschrift waren:

1. Op het niveau van het zorgstelsel: informatie verstrekken over de huidige status van de implementatie van gezondheidschecks voor cardiometabole ziekten in heel Europa en over de voorwaarden om de implementatie te vergemakkelijken;

2. Op het niveau van zorgverleners: meer inzicht geven in de huidige preventie activiteiten, belemmerende en bevorderende factoren voor huisartsen om hun patiënten uit te nodigen voor een gezondheidscheck en hun houding tegenover selectieve preventie van cardiometabole aandoeningen;
3. Op populatieniveau: het onderzoeken van de bereidheid van de doelgroep om deel te nemen aan een gezondheidscheck voor cardiometabole aandoeningen en de belemmerende en bevorderende factoren voor deelname.

Om een beter inzicht te krijgen in contextuele factoren, hebben we vijf landen in meer detail bestudeerd: Tsjechië, Denemarken, Griekenland, Nederland en Zweden.

1. Het gezondheidssysteem

Om een overzicht te geven van de huidige status van selectieve preventie van cardiometabole aandoeningen in Europa, hebben we een onderzoek uitgevoerd onder deskundigen in alle lidstaten van de Europese Unie (EU). In totaal identificeerden we 19 selectieve preventieprogramma's in 16 van de 28 landen. In de meeste programma's waren professionals uit zowel de eerste lijn als de publieke gezondheidszorg betrokken. Preventieprogramma's waren vaker aanwezig in landen met een sterke eerste lijn dan in landen met een zwak eerstelijns systeem. Omdat een duidelijk patroon ontbrak konden ontdekken konden we geen "best practice" van beleidsvorming, ontwikkeling of uitvoering van programma's binnen de bestaande programma's identificeren. Blijkbaar is er geen "one size fits all" manier of een "sine qua non" voor het organiseren van selectieve cardiometabole preventieprogramma's. Deze bevindingen geven aan dat in elk gezondheidszorgsysteem preventieprogramma's haalbaar zijn en dat het belangrijk is om de (organisatie van het) programma aan te passen aan de nationale context (hoofdstuk 2).

2. De zorgverlener

Om verschillende redenen lijkt de huisartspraktijk de optimale omgeving voor de implementatie van selectieve preventie; in de meeste landen hebben huisartsen een langdurige relatie met hun patiënten en zijn zij op de hoogte van hun medische geschiedenis. Bovendien zijn huisartsen in staat om uitleg

te geven over cardiometabool risico, te verwijzen naar leefstijlbehandeling en om medicatie voor te schrijven als dit nodig is. Om de houding en activiteiten van huisartsen op het gebied van selectieve preventie van cardiometabole aandoeningen te bestuderen, hebben we een onderzoek uitgevoerd onder huisartsen in vijf landen: Tsjechië, Denemarken, Griekenland, Nederland en Zweden. In totaal werden 575 vragenlijsten geanalyseerd.

Hoewel de meeste huisartsen selectieve preventie van cardiometabole aandoeningen als zinvol beschouwen, bleek het niet overal in de praktijk gebracht, met grote verschillen in activiteit door huisartsen tussen en binnen landen. Sommige huisartsen gebruikten een actieve benadering (47%) terwijl anderen een opportunistische benadering gebruikten (53%) om individuen uit te nodigen voor een inventarisatie van het risico op cardiometabole aandoeningen, met wisselende percentages per land. De meeste huisartsen beschouwden selectieve preventie van cardiometabole aandoeningen als zinvol (82%) en beschouwden dit als onderdeel van hun taken (84%). De meeste huisartsen hadden een programma voor chronische zorg voor mensen met risicofactor(en) voor hart- en vaatziekten (71%) of diabetes (86%). We concluderen dat hoewel de meeste huisartsen selectieve preventie van cardiometabole aandoeningen als zinvol beschouwden, het niet universeel is geïmplementeerd. Het is belangrijk om de implementatie van selectieve preventie van cardiometabole aandoeningen in de eerste lijn aan te passen aan de nationale context, waarbij belanghebbenden op verschillende niveaus worden betrokken (hoofdstuk 3).

We voerden aanvullende analyses uit op 496 volledige vragenlijsten om de kenmerken van huisartsen te bestuderen in relatie tot het actief benaderen van hun patiënten voor een gezondheidscheck. We concluderen dat de context van de zorg in een land en niet de kenmerken van de huisarts, het actief benaderen van patiënten voor een gezondheidscheck voor cardiometabole aandoeningen bepalen (hoofdstuk 4).

In een systematische literatuurstudie wilden we potentiële bevorderende en belemmerende factoren voor professionals in de gezondheidszorg identificeren voor het uitvoeren van selectieve preventie van cardiometabole aandoeningen in de eerste lijn. Uit de 19 studies die we identificeerden haalden we de meest frequent gerapporteerde belemmerende en bevorderende factoren. Structurele barrières waren bijvoorbeeld te weinig tijd, onvoldoende vergoeding en problemen met richtlijnen; bevorderende factoren waren haalbare en effectieve interventies, voldoende ondersteuning en adequate mogelijkheden

om te verwijzen. Organisatorische barrières waren bijvoorbeeld onvoldoende ICT-ondersteuning, gebrek aan ondersteunende diensten en het ontbreken van geschikte tijden om een afspraak te maken; bevorderende factoren waren voldoende ICT-ondersteuning, logistieke en praktische ondersteuning en samenwerking met medisch personeel. Professionele barrières waren onvoldoende begeleiding en vaardigheden en een gebrek aan kennis en ervaring; voldoende training was een bevorderende factor. Een voorbeeld van een patiënt-gerelateerde barrière was een lage therapietrouw van patiënten; een bevorderende factor was een sterke huisarts-patiëntrelatie. Bovendien was een negatieve houding ten opzichte van preventie een barrière, terwijl een positieve houding en preventie belangrijk vinden bevorderende factoren waren. Veel factoren waren vergelijkbaar in verschillende settings en landen, echter de meeste studies waren uit landen met een vergelijkbaar eerstelijns zorgsysteem, wat de vergelijking met landen met andere eerstelijns systemen bemoeilijkt. Onze suggestie is dat voordat activiteiten voor selectieve preventie gestart worden, eerst lokale factoren worden onderzocht zodat het programma optimaal kan worden afgestemd op de situatie en setting (hoofdstuk 5).

3. De populatie

Om selectieve preventie succesvol te kunnen laten zijn is deelname van de doelgroep aan gezondheidschecks van essentieel belang. We probeerden factoren te vinden die verband houden met de bereidheid om deel te nemen aan gezondheidschecks voor cardiometabole aandoeningen in de eerder genoemde vijf landen. We hebben daartoe een vragenlijst verspreid onder personen in de huisartspraktijk die niet bekend waren met een cardiometabole aandoening. In totaal hebben 1.354 personen gereageerd. Negen procent was niet bereid om deel te nemen aan een gezondheidscheck voor cardiometabole aandoeningen. Mannelijk geslacht, roken, een hogere zelf gerapporteerde gezondheid, nooit eerder zijn uitgenodigd voor een gezondheidscheck en niet bereid zijn om te betalen voor een gezondheidscheck waren gerelateerd aan niet bereid zijn om deel te nemen. De meest genoemde reden om niet te willen deelnemen was: 'Ik denk dat ik gezond ben' (57%). Van de respondenten die wel bereid waren deel te nemen, gaf 94% de voorkeur aan een uitnodiging van de huisarts en 66% was bereid om te betalen voor een gezondheidscheck. De twee belangrijkste redenen om wel deel te willen nemen waren: 'Ik ben nieuwsgierig naar mijn risico op hart- en vaatziekten / diabetes' (74%) en 'Ik wil gezonder zijn' (40%).

We concluderen dat de minderheid van de respondenten in alle vijf landen niet bereid was deel te nemen aan een gezondheidscheck voor cardiometabole aandoeningen. De meerderheid had een voorkeur voor de huisartspraktijk als instelling van voorkeur voor de check. Bovenstaande biedt een veelbelovend startpunt om de deelname aan gezondheidschecks voor cardiometabole aandoeningen in de eerste lijn te verbeteren (hoofdstuk 6).

Om de participatie aan gezondheidschecks in de eerste lijn te verbeteren, moeten we weten welke belemmerende en bevorderende factoren de deelname van mensen bepalen. Daarom voerden we een systematisch literatuuronderzoek uit en identificeerden we 39 studies waaruit belemmerende en bevorderende factoren werden geïdentificeerd. Bevorderende factoren voor deelname waren het willen weten van hun cardiometabole risico, zich verantwoordelijk voelen voor en bezorgd zijn over de eigen gezondheid. Belemmerende factoren waren jongere leeftijd, roken, lage opleiding, zich zorgen maken over de uitkomst van de check, het idee dat het niet erg is of de kans laag is om de aandoening te krijgen, en een negatieve houding ten opzichte van gezondheidschecks of preventie. Bovendien kunnen praktische zaken zoals de beschikbaarheid van informatie en het gemak om een afspraak te maken de participatie beïnvloeden.

We concluderen dat de belemmerende en bevorderende factoren voor het deelnemen aan gezondheidschecks voor cardiometabole aandoeningen heterogeen zijn. Daarom is het niet mogelijk om een "one size fits all"-benadering te ontwikkelen om de deelname te maximaliseren. Voor een optimale implementatie raden we een multifactoriële benadering aan die is aangepast aan de nationale context. Hierbij dient aandacht te zijn voor bevolkingsgroepen die moeilijker te bereiken zijn, zoals mensen met een lagere sociaaleconomische status en migranten (hoofdstuk 7).

In hoofdstuk 8 werden de resultaten van eerdere studies gebruikt om 32 stellingen te ontwikkelen die zouden kunnen dienen als richtlijn voor het implementeren van selectieve preventieprogramma's voor cardiometabole aandoeningen in Europa. We bereikten een hoge mate van consensus tussen deskundigen over meerdere kenmerken voor programma's. Zo werd in het algemeen selectieve preventie van cardiometabole aandoeningen beschouwd als een effectieve aanpak om cardiometabole aandoeningen te voorkomen en werd een proactieve aanpak als effectiever beschouwd in vergelijking met case-finding. De eerste lijn werd beschouwd als de voorkeurssetting.

In **hoofdstuk 9** bespraken we de belangrijkste bevindingen van dit proefschrift en gaven we advies voor de toekomst. We concluderen dat ondanks de positieve houding van huisartsen en de bevolking ten aanzien van selectieve preventie, verschillende uitdagingen op het niveau van de zorgverlener, de bevolking en de zorgorganisatie bestaan. Voor succesvolle implementatie van selectieve preventie in de huisartspraktijk is daarom een verandering in de organisatie en infrastructuur essentieel. Een focus op preventie bij beleidsmakers en de politieke bereidheid om te investeren en om structureel activiteiten voor preventie te financieren, is belangrijk. De EU zou een belangrijke rol kunnen spelen door preventieprogramma's voor cardiometabole aandoeningen tot een politieke prioriteit in heel Europa te maken. Gezien de inconsistente gegevens over de (kosten-) effectiviteit, adviseren wij om verder onderzoek te richten op hoe selectieve preventieprogramma's voor cardiometabole aandoeningen het best in verschillende landen kunnen worden geïmplementeerd.





Dankwoord



Wat een bijzonder moment, het schrijven van het dankwoord voor mijn proefschrift. Dit proefschrift had niet tot stand kunnen komen zonder de hulp van anderen en ik wil hierbij iedereen die direct of indirect heeft bijgedragen aan het tot stand komen van dit proefschrift bedanken.

Allereerst wil ik graag mijn promotieteam bedanken. Wat heb ik geluk gehad met jullie als begeleiders: alle vier ervaren onderzoekers en betrokken bij het project maar ook betrokken bij mij als persoon. Door jullie snelle feedback werd het onderzoek naar 'een hoger level getild', dank daarvoor! (Alhoewel het voor mij soms niet makkelijk was om al jullie feedback én die van alle Europese partners op een lijn te krijgen...)

Niek, ik heb veel geleerd van jouw instelling om dingen niet moeilijker te maken dan dat ze zijn. Jouw helikopterview zorgde ervoor dat ik niet verzandde in details. Je gaf me, ondanks jouw drukke schema, altijd het gevoel ruim de tijd te hebben voor overleg en vragen.

François, jouw grote onderzoekservaring met name op internationaal gebied is van grote waarde geweest tijdens mijn promotietraject. Daarnaast heb ik bewondering voor de manier waarop jij op een hele rustige en overzichtelijke manier overleggen in goede banen leidt en daarbij iedereen de mogelijkheid geeft om zijn of haar zegje te doen.

Niek en François, bedankt dat jullie tijdens een lunchpauze in het zonnetje 'even' het idee voor het SPIMEU project uit jullie mouw hebben geschud, waardoor ik uiteindelijk de mogelijkheid kreeg om hierover mijn proefschrift te schrijven. Monika, jouw praktisch gerichte insteek heeft er voor gezorgd dat ik de toepasbaarheid van het onderzoek niet uit het oog ben verloren. Jouw enthousiasme en motivatie voor het onderzoek werkten aanstekelijk. Daarnaast had jij veel oog voor mijn persoonlijke ontwikkeling en hadden we onder andere gesprekken over huisarts worden, werk-privé balans en het vieren van de 'kleine successen' binnen een promotie traject. Dit was voor mij heel waardevol en ik wil je bedanken dat je hier de tijd voor nam.

Joke, jouw deur stond altijd open voor vragen. Het was erg leerzaam dat je me motiveerde om eerst zelf na te denken over een antwoord op vragen en me handvaten gaf om de rode draad van het onderzoek voor ogen te houden. Je hield de taken en planning altijd goed in de gaten, wat een belangrijke bijdrage heeft geleverd aan het op tijd afronden van dit proefschrift en het hele project, dank daarvoor.

Professor van der Graaf, professor Groenewegen, professor Rutten, professor Ruwaard en Dr. Van Dis, hartelijk bedankt voor het lezen en beoordelen van mijn manuscript.

Mark, bedankt voor je betrokkenheid bij het project. Je hebt veel bijgedragen aan onder andere het ontwikkelen van de vragenlijsten en de analyses. Daarnaast vond ik het erg gezellig dat je erbij was met de SPIM-tripjes naar het buitenland. Gerdien, bedankt voor het op de rit houden van het project en voor de gezellige gesprekken tijdens de tripjes naar het buitenland.

Axel, Martin, Hrafnhildur, Per, Trine, Anders, Jens, Lars, Agapi, Christos, Norbert and Bohumil. It was a pleasure working with all of you in the SPIMEU project. Thank you very much for the good collaboration and interesting meetings. I have learned a lot from all of you and it was a privilege to collaborate with researchers from different countries. Axel, Martin and Per, thank you for your warm welcome during my stay in Stockholm.

I would like to thank all experts, general practitioners and patients for completing the questionnaires.

Verder wil ik graag Karlijn en Leanne bedanken voor hun hulp met de vragenlijsten en Raymond voor de gegevens van de huisartsen. Daarnaast ook mijn dank aan Coby, Henk en Abdel voor het scheppen van de optimale werkomstandigheden.

Een promotie traject is een intensieve tijd en het is erg fijn om het wel en wee met mensen die in hetzelfde schuitje zitten de kunnen delen. Doordat ik twee werkplekken had, heb ik het voorrecht gehad om met veel leuke collega's samen te werken, lunchwandelingen te maken en promotie-ervaringen uit te wisselen. Allereerst (oud-) kamergenoten en promovendi van het Julius centrum: bedankt voor de gezelligheid! Carline, Kevin, Timo, Romin, Valentijn, Faas, Loan, Giske, Suzanne en Pauline het was erg leuk om het begin van mijn promotie traject bij jullie op de kamer te zitten. Timo en Nina, het was een eer om samen met Laura en Denise het JOB voorzitterschap van jullie over te nemen, en vervolgens weer over te dragen op Valentijn. Carline, wat was het leuk in Costa Rica! Ik hoop nog veel wedstrijden tegen en met je te tennissen.

Van Geuns lunch en kamergenootjes: Ietje, Veerle, Roel, Sarah, Eline en Anne Meike, ik mis jullie nu al! Jullie gezelligheid en steun waren van onschatbare waarde de afgelopen 1,5 jaar. Eline, wat hebben wij samen geknald de afgelopen maanden! De laatste loodjes.... Het heeft mij erg geholpen om dit met je te

kunnen delen. Spirelli's: Nicole, Eline en Anne Meike ik hoop nog vaak gezellig met jullie te eten.

Daphne en Ilse, het was fijn om ervaringen te kunnen delen met promovendi binnen hetzelfde onderzoeksveld. Femke, binnenkort kom ik écht op kraamvisite! Nivel kamergenootjes: Judith, Tessa, Lisa, Marleen, Wytske en Jeanine. Ondanks dat ik er niet heel vaak was, hebben jullie me altijd thuis laten voelen bij het Nivel. De gezellige wandelingen tijdens lunch zorgden voor welkome afleiding. Joost, Yvette, Elise en Inge, ondanks dat ik maar kort bij jullie op de kamer zat, hebben jullie erg meegeleefd tijdens mijn drukke laatste maanden, bedankt.

Beste Martin en alle andere medewerkers bij mijn nieuwe werkplek in Nieuw-Vennep, mijn start in jullie praktijk voelde als een warm bad. Ik kijk uit naar een heel gezellig en leerzaam jaar bij jullie.

Ik wil graag ook mijn familie en vrienden bedanken voor hun interesse in mijn promotietraject en vooral ook voor het zorgen voor de nodige ontspanning.

Lieve geneeskunde-vriendinnen: Annelienke, Denise, Geerte en Jolanda. Ondertussen zijn we alweer tien jaar vriendinnen! Ik hoop in de komende jaren op nog minstens zoveel etentjes, weekendjes weg en gezelligheid als in de afgelopen tien jaar, zowel met als zonder onze mannen. Wat is het fijn en bijzonder om met jullie allemaal de promotie-ervaringen te kunnen delen.

Lieve meiden van Merope: Jopy, Lisa, Mathilde, Margo, Iris, Elise en Francien. Ik hoop dat we ondanks onze ambities en drukke banen toch nog af en toe ouderwets blijven 'jaarclubeten'.

Elise en Harm-Pieter, ik kijk uit naar nog veel meer eet-wijn-spelletjes avonden met jullie.

Lieve Anne, Laurien Judy, Mariska en Marianne. Ondertussen zijn we al 16 jaar vriendinnen. We zien elkaar niet vaak, maar als we elkaar zien is het altijd weer als vanouds. Het zal jullie niet verbazen dat het me toch gelukt is om dit proefschrift af te maken ;-)

Rogier, Maurits en Nick: Wat ben ik blij dat mijn vriend zulke leuke vrienden heeft. Janneke, Sannah en Angela, ons weekendje weg kwam voor mij precies op het goede moment, wat was het gezellig en genieton daar met jullie!

Charlotte en Haye, wat is het leuk om een vergelijkbaar koppel zo gezellig in de buurt te hebben wonen!

Lieve Marije en Timo en Anne Meike en Frits ik hoop op nog veel Dixit-avondjes samen met jullie.

Lieve Anne Meike, van collega naar goede vriendin. Jouw optimisme en gezelligheid wisten mij altijd weer op te vrolijken als ik het promoveren even niet meer zag zitten. Je bent altijd erg lief en geïnteresseerd en daarnaast help je me ook nog om de wereld een beetje beter te maken. Ik ben erg blij dat je mijn paranimf bent! En wie weet gaan we ooit nog samen aan de slag in een huisartspraktijk...

Lieve Marije, er was voor mij geen enkele twijfel dat ik jou aan mijn zijde wilde als paranimf. Jouw luisterend oor, alle uren samen sporten en gezellig eten met een wijntje waren onmisbaar tijdens mijn promotietraject. Wat vind ik het leuk dat we allebei zijn aangenomen voor onze opleiding, ik zal je vast nog vaak om hulp vragen bij patiënten met geheugenproblemen. Ik ben heel erg blij met jou als vriendin en ik kijk uit naar nog veel meer gezelligheid en weekendjes weg!

Wat ben ik blij met mijn leuke en gezellige schoonfamilie. Lieve Annette en Jacob, wat is het fijn om bij jullie lekker tot rust komen in de polder. Jullie deur staat altijd open en ik voel me altijd meer dan welkom om lekker aan te schuiven en lekker te kletsen met een kop thee. Lieve Else en Rolf, Wouter en Lara en Floor en Mats, met jullie is het altijd een gezellige boel aan tafel. Dank voor jullie interesse en steun tijdens de afgelopen jaren.

Oma Miep, er is denk ik niemand die zo naar mijn promotie uitgekeken heeft als jij. Wat is het bijzonder dat je, 2 dagen voor je 90^{ste} verjaardag, bij mijn verdediging aanwezig kan zijn. Ik vind het erg fijn om zo'n trotse oma te hebben. Lieve mam en pap, waar zal ik beginnen... Jullie steun, liefde en vertrouwen is onbeschrijfelijk. Jullie hebben me altijd gestimuleerd om mijn eigen keuzes te maken. Ik kan altijd bij jullie terecht en jullie leven altijd erg met me mee. Bedankt voor alles. En ik hoop nog heel veel mooie wandelingen met jullie mee te maken de komende jaren. Lieve mam, wat ben ik er trots op dat jij zo creatief bent. Heel erg bedankt voor het maken van de schildering voor de omslag van mijn proefschrift.

Allerliefste Jan-Willem, wat ben ik blij met jou. Je bent altijd heel positief en je nuchterheid werkt heerlijk relativerend. Dankjewel voor je begrip en liefde tijdens de afgelopen drukke maanden. Ik hoop samen met jou nog heel veel van de wereld te zien, maar vooral ook weer lekker samen thuis te komen.

Anne-Karien, september 2018



About the author





Anne-Karien Maria de Waard was born in Leiden, the Netherlands, on 13 January 1990 and grew up in Alphen aan den Rijn. After graduation from secondary school (Ashram college) in 2008, she studied Medicine at Utrecht University where she obtained her medical degree in 2014. During her Bachelor's degree she was also enrolled in the honours programme of Medicine, which included research in the field of endothelial progenitor cells. In 2015 she worked six months as a resident doctor at the neurology department in the Diaconessenhuis, Utrecht. In July 2015 she started her PhD project at the Julius Center

under supervision of prof. dr. N. J. de Wit, prof. dr. F. G. Schellevis, dr. M. Hollander and dr. ir. J. C. Korevaar, which resulted in the studies presented in this thesis. During her PhD trajectory she was chairmen of the 'Jonge Onderzoekers Bijeenkomst'(JOB, the Junior Researcher Meeting) and she also started the post-graduate master Epidemiology, with specialisation clinical epidemiology, which she expects to complete in 2019. She started her training at the Amsterdam UMC - VU Medical Center in September 2018 to become a general practitioner.

List of publications

Wändell PE, **de Waard AM**, Holzmann MJ, Gornitzki C, Lionis C, de Wit N, Søndergaard J, Sønderlund AL, Kral N, Seifert B, Korevaar JC, Schellevis FG, Carlsson AC. Barriers and facilitators among health professionals in primary care to prevention of cardiometabolic diseases: A systematic review. *Fam Pract.* 2018 Jan 29. doi: 10.1093/fampra/cmz137.

de Waard AM, Wändell PE, Holzmann MJ, Korevaar JC, Hollander M, Gornitzki C, de Wit N, Schellevis FG, Lionis C, Søndergaard J, Seifert B, Carlssonon AC. Barriers and facilitators to participation in a health check for cardiometabolic diseases in primary care: A systematic review. *Eur J Prev Cardiol.* 2018 Aug;25(12):1326-1340. doi: 10.1177/2047487318780751.

de Waard AM, Hollander M, Korevaar JC, Nielen MMJ, Carlsson AC, Lionis CH, Seifert B, Thilsing T, de Wit N, Schellevis FG, Selective prevention of cardiometabolic diseases: activities and attitudes of general practitioners across Europe. *European Journal of Public Health*, 16 July 2018, cky112, <https://doi.org/10.1093/eurpub/cky112>

Conference presentations

WONCA 2016, Thilsing, T., **Waard, A.K. de**, Korevaar, J., Wandell, P., Holzmann, M., Carlsson, A., Wit, N. de, Seifert, B., Lionis, C., Søndergaard, J., Bruun Larsen, L., Schellevis, F. Selective prevention of cardio-metabolic diseases across Europe - current work and future perspectives.

WONCA 2016, **Waard, A.K. de**, Korevaar, J., Hollander, M., Wit, N. de, Lionis, C., Thilsing, T., Carlsson, A., Seifert, B., Schellevis, F. How is selective prevention of cardiometabolic diseases organized in the EU member states

WONCA 2017, Prof. Per Wändell, Martin J. Holzmann, Axel C. Carlsson, **Anne-Karien de Waard**, Anders Larrabee Sønderlund, Trine Thilsing, Joke Korevaar, Prof. Niek de Wit, Prof. Bohumil Seifert, Prof. Christos Lionis, Agapi Angelaki, Prof. Jens Søndergaard, Lars Bruun Larsen, Prof. François Schellevis. Selective prevention of cardio-metabolic diseases across Europe: What's the hold up?

EPCCS 2017, **A.K.M. de Waard**, J.C. Korevaar, F.G. Schellevis, N.J. de Wit, M. M. J. Nielen, A. L. Sønderlund, C. Lionis, N. Král, A. C. Carlsson, M. Hollander. The working methods and attitude of general practitioners in five EU Member States towards selective prevention of cardiometabolic diseases: results from the SPIMEU project. (Poster prize)

