# NHS Health Check programme:

Annotated Bibliography: September 6th 2018 – November 13th 2018

# About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

Public Health England
133-155 Waterloo Road
Wellington House
London SE1 8UG
Tel: 020 7654 8000
www.gov.uk/phe
Twitter: @PHE_uk
Facebook: www.facebook.com/PublicHealthEngland

# Contents

# Acknowledgements

# A review of NHS Health Check literature

## 1.    Introduction

The NHS Health Check is a National programme that aims to prevent heart disease, stroke, diabetes and kidney disease, and raise awareness of dementia both across the population and within high risk and vulnerable groups.

A key part of the programme's governance structure is the expert scientific and clinical advisory group (ESCAP). The ESCAP provides an expert forum for the NHS Health Check policy, acting in an advisory capacity to support successful roll-out, maintenance, evaluation and continued improvement based on emerging and best evidence. In its first meeting ESCAP agreed to progress an initial, broad literature review to identify evidence relevant to the NHS Health Check programme. This remit was later expanded to include identification of evidence on general health checks, diabetes/ cardiovascular disease (CVD) risk screening in the population and CVD prevention in primary care . The methods and findings of that review are set out here.

## 2.    Methods

Medline, PubMed, Embase, Health Management Information Consortium (HMIC), Cumulative Index of Nursing and Allied Health Literature (CINAHL), Global Health, PsycInfo, the Cochrane Library, NICE Evidence Search, TRIP database, Google Scholar,  Google, Clinical Trials.gov, ISRCTN registry and Prospero were searched for references relevant to the NHS Health Check programme, general health checks, diabetes and cardiovascular screening and cardiovascular disease prevention.

Previous searches had identified references from between January 1996 and September 5th 2018. This search identifies references from **September 6th 2018 to November 13th 2018**. The cut-off date for internet searches was **November 14th 2018**.

Table 1. Search strategies

| Database | Search strategy |
|---|---|
| Ovid Medline | 1. health check*.tw.<br>2. (diabetes adj3 screen*).tw.<br>3. (cardiovascular adj3 screen*).tw.<br>4. (population adj2 screen*).tw.<br>5. (risk factor adj3 screen*).tw.<br>6. (opportunistic adj3 screen*).tw.<br>7. medical check*.tw.<br>8. general check*.tw.<br>9. periodic health exam*.tw.<br>10. annual exam*.tw.<br>11. annual review*.tw.<br>12. NHSHC.tw.<br>13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12<br>14. cardiovascular adj3 prevention.tw.<br>15. (primary care or general practice or primary healthcare).tw<br>16. 14 and 15<br>17. Cardiovascular Diseases/ AND Primary Prevention/<br>18. 16 or 17<br>19. 13 or 18<br>20. 2018 09*.dt.<br>21. 2018 10*.dt.<br>22. 2018 11*.dt.<br>23. 20 or 21 or 22<br>24. 19 and 23 |
| PubMed | 1. health check*<br>2. diabetes screen*<br>3. cardiovascular screen*<br>4. population screen*<br>5. risk factor screen*<br>6. opportunistic screen*<br>7. medical check*<br>8. general check*<br>9. periodic health exam*<br>10. annual exam*<br>11. annual review*<br>12. NHSHC<br>13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12<br>14. Cardiovascular Diseases AND Primary Prevention[MeSH Terms]<br>15. "primary care"[Text Word] OR "general practice"[Text Word] OR "primary healthcare"[Text Word])<br>16. (cardiovascular[Text Word] AND prevention[Text Word])<br>17. #15 and #16<br>18. #14 or #17<br>19. #13 or #18 Filters: Publication date from 2018/09/06 to 2018/11/13 |

Ovid Embase

1. health check*.tw.
2. (diabetes adj3 screen*).tw.
3. (cardiovascular adj3 screen*).tw.
4. (population adj2 screen*).tw.
5. (risk factor adj3 screen*).tw.
6. (opportunistic adj3 screen*).tw.
7. medical check*.tw.
8. general check*.tw.
9. periodic health exam*.tw.
10. annual exam*.tw.
11. annual review*.tw.
12. NHSHC.tw.
13. periodic medical examination/
14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13
15. cardiovascular adj3 prevention.tw.
16. (primary care or general practice or primary healthcare).tw
17.  15 and 16
18.  cardiovascular disease/ AND primary prevention/
19.  17 or 18
20. 14 or 19
21. limit 20 to dc=20180906-20181113

Ovid HMIC

1 "health check*".af.
2 health checks/
3 (cardiovascular or vascular or heart or diabetes or stroke).af.
4 (screen* or risk).af.
5 3 AND 4
6 1 OR 2 or 5
7 cardiovascular adj3 prevention.tw.
8 (primary care or general practice or primary healthcare).tw
9 7 and 8
10 Cardiovascular diseases/ AND exp preventive medicine/
11 9 or 10
12 6 or 11
13 limit 12 to yr="2018"

| | |
|---|---|
| EBSCO CINAHL | S12 S10 AND S11 |
| | S11 S1 OR S2 OR S9 |
| | S10 EM 20180906-20181113 |
| | S9 S5 OR S8 |
| | S8 S6 AND S7 |
| | S7 (MH "Preventive Health Care+") |
| | S6 (MH "Cardiovascular Diseases+") |
| | S5 S3 AND S4 |
| | S4 "primary care" or "general practice" or "primary healthcare" |
| | S3 TX cardiovascular N3 prevention |
| | S2 (diabetes N3 screen*) OR (cardiovascular N3 screen*) OR (population N2 screen*) OR (risk factor N3 screen*) OR (opportunistic N3 screen*) OR "medical check*" OR "general check*" OR "periodic health exam*" OR "annual exam*" OR "annual review*" OR NHSHC |
| | S1 health check* |
| | |
| EBSCO Global Health | S10 S6 OR S19 OR S3  Limiters - Publication Year: 2018 |
| | S9 S7 AND S8 |
| | S8 DE "preventive medicine" |
| | S7 DE "cardiovascular diseases" |
| | S6 S4 AND S5 |
| | S5 "primary care" or "general practice" or "primary healthcare" |
| | S4 TX cardiovascular N3 prevention |
| | S3 S1 OR S2 |
| | S2 (diabetes N3 screen*) OR (cardiovascular N3 screen*) OR (population N2 screen*) OR (risk factor N3 screen*) OR (opportunistic N3 screen*) OR "medical check*" OR "general check*" OR "periodic health exam*" OR "annual exam*" OR "annual review*" OR NHSHC |
| | S1 health check* |
| | |
| Ovid PsycInfo | 1. health check*.tw. |
| | 2. (diabetes adj3 screen*).tw. |
| | 3. (cardiovascular adj3 screen*).tw. |
| | 4. (population adj2 screen*).tw |
| | 5. (risk factor adj3 screen*).tw. |
| | 6. (opportunistic adj3 screen*).tw. |
| | 7. medical check*.tw. |
| | 8. general check*.tw. |
| | 9. periodic health exam*.tw. |
| | 10. annual exam*.tw. |
| | 11. annual review*.tw. |
| | 12. NHSHC.tw. |
| | 13. health screening/ or physical examination/ |
| | 14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 |
| | 15. (cardiovascular adj3 prevention).tw. |
| | 16. (primary care or general practice or primary healthcare).tw. |
| | 17. 15 and 16 |
| | 18. CARDIOVASCULAR DISORDERS/ and PREVENTIVE MEDICINE/ |
| | 19. 17 or 18 |
| | 20. 14 or 19 |
| | 21. limit 20 to up=20180906-20181113 |

| Cochrane Library (Wiley) | #1 "health check*"<br>#2 (diabetes next/3 screen*) or (cardiovascular next/3 screen*) or (population next/2 screen*) or (opportunistic next/2 screen*) or ("risk factor" next/3 screen*) or "medical check*" or "general check*" or "periodic health exam*" or "annual exam*" or "annual review*" or NHSHC<br>#3 cardiovascular adj3 prevention.tw.<br>#4 (primary care or general practice or primary healthcare).tw<br>#5 #3 and #4<br>#6 MeSH descriptor: [Cardiovascular Diseases] this term only<br>#7 MeSH descriptor: [Primary Prevention] explode all trees<br>#8 #6 and #7<br>#9 #5 or #8<br>#10 #1 or #2 or #9 Publication Year from 2018 |
|---|---|
| NHS Evidence | "*health check*" OR *cardiovascular prevention primary*<br>Limited to 06/09/2018 to 13/11/2018 |
| TRIP database | "*health check*\*" OR *cardiovascular prevention primary*<br>Since 2018 |
| Google Scholar | *"nhs health check"*<br>*cardiovascular "health check"*<br>*cardiovascular prevention primary care*<br>*nhs health check program*<br>Since 2018, sorted by date. |
| Google | "*nhs health check*"<br>*cardiovascular prevention "primary care"*<br>*cardiovascular "health check"*<br>*CVD risk prediction*<br>*nhs health check program*<br>Limited to 06/09/2018 to 13/11/2018 |
| Clinical trials.gov, ISRCTN, Prospero | *"health check",* Limited to 06/09/2018 to 13/11/2018 |

Citation titles and abstracts were then screened in order to determine whether or not they were relevant. Those citations considered relevant were categorised using the PHE Types of Information, and are listed below in section 4. Categorisation has been based on information provided by authors/indexers and has not been independently verified. No appraisal of individual resources has been undertaken. A summary of the main aim, methods and results of each citation is provided, as well as a link to the abstract or full text, if available. If the full text of an article is not freely available online, it may be available via the PHE Knowledge & Library Services or OpenAthens.

# 3.    Results

The number of references identified are shown in table 2 and 2a.

Table 2. Citations published/entered between September 6th 2018 and November 13th 2018

| Database | No. of hits | Exclusive (non duplicates) |
|---|---|---|
| Ovid Medline (June 20th – Sept 5th 2018) | 471 | 470 |
| PubMed  (June 20th – Sept 5th 2018) | 379 | 130 |
| Ovid Embase (June 20th – Sept 5th 2018) | 867 | 610 |
| Ovid HMIC (up to latest edition July 2018) | 22 | 20 |
| EBSCO CINAHL (June 20th- Sept 5th 2018) | 348 | 241 |
| EBSCO Global Health (2018) | 257 | 236 |
| Ovid PsycInfo (June 20th- Sept 5th 2018) | 41 | 31 |
| Cochrane Library (June 2018 to Sept 2018) | 29 | 25 |
| NICE Evidence (June 20th to September 6th 2018) | 547 | 540 |
| TRIP database (2018) | 590 | 432 |
| **TOTAL** | | **2735** |

Table 2a. Citations added to internet sources between Sept 6th 2018 and Nov 13th 2018

| Internet sources | No. of hits |
|---|---|
| Google Scholar | 342 |
| Google (June 20th- Sept 6th 2018) | 650 |
| Trials registers, Prospero () | 5 |
| **TOTAL** | **997*** |

*Note: it is not possible to know how many of these are unique citations.*

From these results, 2 were identified as being relevant to the NHS Health Check programme,  4 to general health checks and 25 to diabetes/cardiovascular disease risk screening or CVD prevention.

**Total relevant references = 31**
- **NHS Health Checks = 2**
- **general health checks = 4**
- **diabetes/cardiovascular disease screening or CVD prevention = 25**

# 4. References on the NHS Health Check Programme (2)

## Qualitative

Alageel, S., Gulliford, M. C., McDermott, L., et al. 2018. **Implementing multiple health behaviour change interventions for cardiovascular risk reduction in primary care: a qualitative study**. BMC family practice 19(1) 171

AIM: to identify barriers and facilitators to implementing multiple health behaviour change interventions for cardiovascular disease (CVD) risk reduction in primary care.

METHOD: Qualitative study using semi-structured interviews informed by the Theoretical Domains Framework. Interviews were conducted with a purposive sample of healthcare professionals working in the implementation of the NHS Health Check programme in London. Data were analysed using the Framework method.

RESULTS: Thirty participants were recruited including ten general practitioners, ten practice nurses, seven healthcare assistants and three practice managers from 23 practices. Qualitative analysis identified three main themes: healthcare professionals' conceptualising health behaviour change; delivering multiple health behaviour change interventions in primary care; and delivering the health check programme. Healthcare professionals generally recognised the importance of health behaviour change for CVD risk reduction but were more sceptical about the potential for successful intervention through primary care. Participants identified the difficulty of sustained behaviour change for patients, the lack of evidence for effective interventions and limited access to appropriate resources in primary care as barriers. Discussing changing multiple health behaviours was perceived to be overwhelming for patients and difficult to implement for healthcare professionals with current primary care resources. The health check programme consists of several components that are difficult to fully complete in limited time.

View full text

## Ongoing research

Public Health England 2018. **NHS Health Check Programme Digital Exemplar**.

The NHS Health Check programme was selected as one of the eight Digital Exemplars.

AIM: PHE's national Digital, CVD Prevention and Behavioural Insight Teams are working in partnership to explore how digital technology could be used to support the NHS Health Check programme

View details

# References relating to general health checks (4)

## Cohort studies

Tarride, J. E., Smofsky, A., Nykoliation, P., et al. 2018. **Effectiveness of a Type 2 Diabetes Screening Intervention in the Canadian Workplace.** Can J Diabetes 42(5) 493-499.e1 Available:

AIM: to evaluate the effectiveness of Motivaction, a Canadian diabetes screening and education pilot program, in the workplace.

METHOD: The Motivaction program involves a voluntary web-based diabetes health-risk assessment, the Canadian Diabetes Risk Questionnaire (CANRISK), combined with an opportunity for those eligible (i.e. having diabetes or having a CANRISK score >/=21) to attend 2 on-site biometric screening meetings with a registered nurse and 4 educational sessions by telephone with a certified diabetes educator.

RESULTS: Attendance at the initial and 6-month clinical visits included 293 people. At baseline, 21% were identified as having prediabetes (13%) or having diabetes (8%). Statistically significant reductions in glycated hemoglobin levels from baseline to the study's end were observed in those with prediabetes or diabetes. No statistically significant changes in glycated hemoglobin levels were observed in individuals with normal levels or in those at risk for diabetes at baseline. No statistical differences were observed in terms of productivity or mental health for the full population or across diabetes-risk categories. More than 90% of employees would recommend the Motivaction program to other employers.

View abstract

Veronesi, G., Gianfagna, F., Borchini, R., et al. 2018. **Cardiovascular disease screening at the workplace: Discrimination ability of lifestyle risk factors and job-related conditions**. Occupational and Environmental Medicine 75(Supplement 2) A60.

AIM: to investigate the discrimination ability at 10 years of lifestyle (LS) and job-ralted conditions (JRC) in a Northern Italian working male population.

METHODS: n=2532 men, 35-64 years, CVD-free and employed at the time of recruitment (1989-1996) in either the MONICA- Brianza and PAMELA (population-based) or the SEMM (factory-based) cohorts, were available for the analyses. The following LS and JRC were ascertained using standardised procedures: smoking (current vs non-current); alcohol intake (drinks/day; 1-3 drinks as reference); habitual occupational and sport physical activity (PA; the Baecke questionnaire); job strain (high vs non-high; Job Content Questionnaire) and BMI, from measured height and weight. Workers were followed- up (median 14 years) until first major coronary event or ischaemic stroke, fatal or non-fatal.

RESULTS: n=162 events occurred during follow-up (10 year risk: 4.3%). BMI was not associated with the endpoint. The risk factors meeting the AI Criterion were: smoking (Hazard Ratio=2.49, 95% CI: 1.81 to 3.42); alcohol intake (abstainers: HR=1.52, 1.03-2.23; 6+drinks/day: HR=1.81, 1.11-2.95); job strain (HR=1.39, 0.98-1.97); combined sport and occupational PA (p=0.02), as the HRs for sport PA changed between workers at low (HR=0.42) and intense (HR=1.55) occupational PA (interaction test p=0.001). The LS and JRC model had the same discrimination (AUC=0.75; 95% CI: 0.70 to 0.78) than the model with clinical and biological risk factors (AUC=0.75); this finding was consistent across the occupational classes.

View abstract

## Qualitative

Sommer, I., Titscher, V. & Gartlehner, G. 2018. **Participants' expectations and experiences with periodic health examinations in Austria - a qualitative study.** BMC health services research 18(1) 823.

AIM: to explore the motivations and reasons of adult citizens in Austria for attending periodic health examinations (PHE) as well as their satisfaction with the way PHE are organized.

METHOD: We conducted three focus groups with a random sample of previous attenders of PHE. Participants were stratified by age, gender, and education. The discussions were recorded, transcribed, and analyzed using a thematic analysis approach.

RESULTS: Main motivations of attenders (n = 30) were to detect diseases early, to prevent suffering, and to live a long, healthy life. They believed that PHE work as an incentive of health behavior change. As possible reasons not to attend PHE, participants mentioned lack of awareness, time constraints, unpleasant prior experiences, and fear

of harm or negative consequences. They wanted the range of examinations to be selected based on individual risks and to be more comprehensive. Some participants expressed frustration with the lack of time doctors dedicated to the examination or discussion of the results. Throughout the discussion, participants realized there is a great diversity among doctors in the quality of health examinations and how content is delivered.,
View full text

## Modelling studies

Si, S., Moss, J., Karnon, J., et al. 2018. **Cost-effectiveness evaluation of the 45-49 year old health check versus usual care in Australian general practice: A modelling study**. PloS one 13(11) e0207110.

AIM: to assess the potential cost-effectiveness of the 45-49 year old health check versus usual care in Australian general practice using secondary data sources

METHOD: Risk factor profiles were generated for a hypothetical Australian cohort using data from the National Health Survey. Intervention effects were modelled based on a meta-analysis on risk factor changes in the 5 years after a health check. The Framingham Risk Equation was applied to estimate the 5-year cardiovascular disease (CVD) incidence in the health check and usual care group respectively. A Markov model was then constructed to extrapolate long-term CVD outcomes, health care costs and Quality Adjusted Life Years (QALYs) in both groups. Health check-related costs, applied to the health check group, were estimated from clinical guideline and experts' opinion. Lifetime costs, applied to both groups, included costs of hospitalization for CVD events and associated post-event health service use. The Incremental Cost-Effectiveness Ratio (ICER) was calculated for male and female patients respectively

RESULTS: Compared to usual care, the health check reduced CVD incidence for both males (RR = 0.87) and females (RR = 0.91) over a 5-year time. In a lifetime projection, health check led to an average 0.008 and 0.003 QALYs gained per male and female participants respectively. The estimates ICERs were AU $42,355 and AU $133,504 per QALY gained for males and females, respectively. A probabilistic sensitivity analysis demonstrated a probability of cost-effectiveness of 17.5% and 0% for male and female attendees, assuming a willingness to pay threshold of AU $28,000 per QALY gained.
View full text

# References relating to diabetes and cardiovascular disease risk screening or CVD prevention (25)

| Guidance |
| --- |
| Tobe S, Stone JA and Anderson T. 2018. **Canadian Cardiovascular Harmonized National Guidelines Endeavour (C-CHANGE) guideline for the prevention and management of cardiovascular disease in primary care**. CMA Infobase (Canada). |

AIM: to bring together a comprehensive set of recommendations drawn from the nine participating guideline groups applicable to the care of people with multiple comorbidities.

METHOD: This C-CHANGE guideline update was developed by a volunteer guideline panel, which is a scientific committee that reflects the authors of this paper and draws representation from each of the guideline partner organizations involved in the C-CHANGE process, along with primary care physicians with expertise in guideline dissemination. CHANGE works with each of the guideline groups to support quality improvement in guideline development in the domains outlined by the AGREE II Instrument. The C-CHANGE process uses a modified Delphi method to select a subset of all of the guideline partners' recommendations that are appropriate for a primary care setting.

RESULTS: CHANGE promotes patient care by bringing nine guideline groups together, to provide a composite set of recommendations to help clinicians formulate a comprehensive treatment plan directed toward patient priorities. The 2018 update to the C-CHANGE guideline includes a total of 77 recommendations and 52 recommendations that are newly added or updated. A new category for hypertension for high-risk individuals has been developed with a new lower threshold for treatment (130 mm Hg systolic) and target blood pressure (< 120 mm Hg systolic). Multifaceted care for patients with cardiovascular risks includes the cornerstones of health behaviour change, such as healthy eating and regular physical activity

View full text

British Heart Foundation 2018. **Turning back the tide on heart and circulatory diseases**.

AIM: to make key recommendations on achieving the biggest impact for people with or at risk of heart and circulatory diseases.

METHOD: evidence review, full methods unclear

RESULTS: Our five-point plan for tackling heart and circulatory diseases 1. Tackling the big population health problems. Reducing the risk of developing heart and circulatory diseases for millions more people with population-level interventions that curb the damage currently being caused by toxic air, addressing the devastating impact of obesity and giving people the support they need to stop smoking. 2. Detecting earlier the major risk factors for heart attack and stroke. Finding and diagnosing millions more people at high risk of developing heart and circulatory diseases due to high blood pressure, raised cholesterol and atrial fibrillation (AF), and giving the right treatment and support so that conditions can be managed. 3. Improving timely access to the best treatments. Stamping out unwarranted variation in access to treatments for people with heart and circulatory diseases such as heart failure, which is often associated with multiple other long-term conditions. 4. Reimagining rehabilitation services. Avoiding thousands of cases of readmission to hospital and improving quality of life for millions of people by reimagining how we support people recovering from critical events such as heart attack and stroke, and those living with the burden of chronic heart failure. 5. Exploiting the potential of technology and data science. Utilising the enormous potential of technology and data science across all of these areas, transforming the way we prevent, diagnose, treat and support those at risk of or living with heart and circulatory diseases.

View full text

Public Health England 2018. **Cardiovascular Disease Prevention: Return on Investment Tool**.

AIM: to report the results of a series of exemplar analyses in which detection/management of each condition or usage of each intervention are optimised in turn and compared. These analyses help give some indication to tool users about which interventions or detection and management strategies are likely to provide the most benefit.

METHOD: Literature reviews were carried out to identify evidence for effectiveness and cost-effectiveness of interventions that improve the detection and management of the CVD high-risk conditions. The tool was

developed with input from a tool user group who provided information about local priorities for CVD and their requirements for a CVD prevention ROI tool.

RESULTS: The results indicate that optimising detection and management of people with QRISK ≥ 10% results in the highest short-term benefits, whereas detection and management of diabetes provides the most benefit in the long-term. Of individual interventions, statins give the most benefits in the short-term and anti-hypertensives or annual review in the long-term. Most lifestyle interventions are not cost-saving within the time horizon of the model, but this does not rule them out from being cost-saving over longer time horizons.

View full text

## Evidence summaries

NIHR 2018. **NIHR Signal: People take prescribed statins more reliably after discussing their advantages and disadvantages**. National Institute for Health Research Signal

AIM: NIHR Signals explain why the study was needed, what the researchers did, what the study found, how this relates to current guidelines and what the implications are of the findings. They are accompanied by commentary from experts in their field, researchers and those working in practice.

METHOD: This systematic review reported on the perspectives of 888 adults about taking statins. The 32 qualitative studies were conducted across eight countries, mostly in the UK and US. At least 41% of participants had taken statins. Studies included people who were at risk of developing CVD (primary prevention) and people who were advised to take statins to prevent a further heart attack or stroke (secondary prevention). Most studies used face-to-face interviews.

RESULTS: •Five main themes emerged as barriers to the use of statins: scepticism about clinician's motivation; side effects and possible toxicity; cost; unclear benefits, and fear of dependence on statins. •Two themes drove statin usage: believing statins work and are a positive step to prolonging good quality of life, and convenience of fitting them into the daily routine. •Those who took statins reported noticeable improvements in their cholesterol levels from blood tests which encouraged further use. •When used for secondary prevention, patients felt that statins were the main reason for improvement in their condition. They were viewed as more effective than behavioural and dietary modification. •To enable informed decision making, patients wanted more specific information on the mechanism of action of statins.

View full text

Bowen, M. E., Schmittdiel, J. A., Kullgren, J. T., et al. 2018. **Building Toward a Population-Based Approach to Diabetes Screening and Prevention for US Adults.** Current Diabetes Reports 18(11) 104

AIM: to propose a framework for population-based diabetes prevention that links screening and prevention activities across key stakeholders. We also discuss gaps in current practice, while highlighting opportunities to improve diabetes screening and prevention efforts population-wide.

RESULTS: Awareness of diabetes risk is low, and many adults with prediabetes are not identified through existing screening efforts. Accumulating evidence and policies support expansion of the Diabetes Prevention Program (DPP) into clinical and community settings. However, the infrastructure to facilitate referrals and promote data exchange among patients, clinical settings, and community-based DPP programs is lacking.

View abstract

Buckley, L. F., Carbone, S., Aldemerdash, A., et al. 2018. **Novel and Emerging Therapeutics for Primary Prevention of Cardiovascular Disease.** American Journal of Medicine

AIM: to highlight recent advances in the pharmacotherapeutic management of the cardiovascular risk factors of hyperglycemia, dyslipidemia, and obesity.

METHOD: a review examining key subgroups within recent cardiovascular outcome trials, weighing the risks and benefits of several novel therapeutics, and providing practical insight into the use of these agents.

RESULTS: Although lifestyle modification can improve many cardiovascular risk factors, subclinical atherosclerotic cardiovascular disease is present in many individuals despite a healthy cardiovascular lifestyle. Several new pharmacologic therapeutics have demonstrated efficacy in the prevention of cardiovascular outcomes in patients with established cardiovascular disease. In select patients without established cardiovascular disease, these same agents may provide clinically relevant protection against cardiovascular disease.

View abstract

Connelly D. 2018. **Statins: the highs and the lows- infographic**. Pharmaceutical Journal 28 Sep.
AIM: this infographic covers dispensing data, risk vs. benefits, and landmark trials on statins.
RESULTS:  Almost 70 million prescription items were dispensed in England 2017, up from 44 million a decade ago. However the cost has fallen over the same period from £506 million to £136 million.
View infographic

Ravnskov, U., de Lorgeril, M., Diamond, D. M., et al. 2018. **LDL-C does not cause cardiovascular disease: a comprehensive review of the current literature.** Expert review of clinical pharmacology 11(10) 959-970
AIM:  to delineate the errors in three large statin reviews recently published
MeTHOD: evidence review, methods unclear
RESEARCH: Despite the fact that LDL-C is routinely referred to as the 'bad cholesterol', we have shown that high LDL-C levels appear to be unrelated to the risk of CVD, both in FH individuals and in the general population and that the benefit from the use of cholesterol-lowering drugs is questionable. Therefore, a systematic search for other CVD risk factors is an important topic for future research.
View full text

Sonal, S., Susan, Z., Alan, S. G., et al. 2018. **Statins for Primary Prevention in Older Adults-Moving Toward Evidence-Based Decision-Making**. Journal of the American Geriatrics Society 66(11) 2188.
AIM: to summarise the presentations and discussions of a workshop to determine the efficacy and safety of statins for primary prevention of atherosclerotic cardiovascular disease (ASCVD) events in older adults, especially those aged 80 and older and with multimorbidity.
METHOD: The National Institute on Aging and the National Heart, Lung and Blood Institute convened A multidisciplinary expert panel from July 31 to August 1, 2017, to review existing evidence, identify knowledge gaps, and consider whether statin safety and efficacy data in persons aged 75 and older without ASCVD are sufficient; whether existing data can inform the feasibility, design, and implementation of future statin trials in older adults; and clinical trial options and designs to address knowledge gaps.
RESULTS: There is insufficient evidence regarding the benefits and harms of statins in older adults, especially those with concomitant frailty, polypharmacy, comorbidities, and cognitive impairment; a lack of tools to assess ASCVD risk in those aged 80 and older; and a paucity of evidence of the effect of statins on outcomes of importance to older adults, such as statin-associated muscle symptoms, cognitive function, and incident diabetes mellitus.
View abstract

## Systematic reviews

Ju I, Banks E, Calabria B et al. 2018. **General practitioners' perspectives on the prevention of cardiovascular disease: systematic review and thematic synthesis of qualitative studies**. BMJ Open 8 (11).
AIM: to describe the perspectives of general practitioners (GPs) on the prevention of CVD across different contexts.
METHOD: Systematic review and thematic synthesis of qualitative studies using the Enhancing Transparency of Reporting the Synthesis of Qualitative research (ENTREQ) framework. Data sources: MEDLINE, Embase, PsycINFO and CINAHL from database inception to April 2018.
RESULTS: 34 studies involving 1223 participants across nine countries. Six themes: defining own primary role (duty to prescribe medication, refraining from risking patients' lives, mediating between patients and specialists, delegating responsibility to patients, providing holistic care); trusting external expertise (depending on credible evidence and opinion, entrusting care to other health professionals, integrating into patient context); motivating behavioural change for prevention (highlighting tangible improvements, negotiating patient acceptance, enabling autonomy and empowerment, harnessing the power of fear, disappointment with futility of advice); recognising and accepting patient capacities (ascertaining patient's drive for lifestyle change, conceding to ingrained habits, prioritising urgent comorbidities, tailoring to patient environment and literacy); avoiding overmedicalisation (averting long-term dependence on medications, preventing a false sense of security, minimising stress of sickness) and minimising economic burdens (avoiding unjustified costs to patients, delivering practice within budget, alleviating healthcare expenses).
View full text

Nayak A, Hayen A, Zhu L et al. 2018. **Legacy effects of statins on cardiovascular and all-cause mortality: a meta-analysis**. BMJ Open 8(9)

AIM:  to assess evidence for 'legacy' (post-trial) effects on cardiovascular disease (CVD) mortality and all-cause mortality among adult participants of placebo-controlled randomised controlled trials (RCTs) of statins.

METHOD: Meta-analysis of aggregate data. Placebo-controlled statin RCTS for primary and secondary CVD prevention.

Data sources: PubMed, Embase from inception and forward citations of Cholesterol Treatment Trialists' Collaborators RCTs to 16 June 2016.

RESULTS: Eight trials, with mean post-trial follow-up ranging from 1.6 to 15.1 years, and including 13 781 post-trial deaths (6685 CVD). Direct effects of statins within trials were greater than legacy effects post-trials. The pooled data from all eight studies showed no evidence overall of legacy effects on CVD mortality, but some evidence of legacy effects on all-cause mortality (p=0.01). Exploratory subgroup analysis found possible differences in legacy effect for primary prevention trials compared with secondary prevention trials for both CVD mortality (p=0.15) and all-cause mortality (p=0.02). Pooled post-trial HR for the three primary prevention studies demonstrated possible post-trial legacy effects on CVD mortality (HR=0.87; 95% CI 0.79 to 0.95) and on all-cause mortality (HR=0.90; 95% CI 0.85 to 0.96).

View full text

Martin Ruiz E, Olry de Labry A and Epstein D. 2018. **Primary prevention of cardiovascular disease: an umbrella review.** Anales del sistema sanitario de Navarra Sep 21.

AIM:  to determine the effectiveness of non-pharmacological interventions for prevention of cardiovascular disease (CVD) events and mortality in healthy adults or those at high risk of CVD.

METHOD: An umbrella review about primary prevention of non-pharmacological interventions was undertaken in key databases as PubMed Health, Effective Health Care Program AHRQ, McMaster University and the Cochrane Plus until July 2017. The primary outcomes were the relative risk of fatal and non-fatal CVD events, and mortality. Secondary outcomes were adverse events.

RESULTS: Twenty-four reviews were included of which thirteen reported outcomes of interest. Four of these found a pooled statistically significant risk reduction: dietary supplements of vitamin D, increased consumption of omega 3 fatty acids, Qigong, and counselling or education to modify more than one cardiovascular risk factor. Seven studies reported adverse events but minor or insignificant with respect to the control group.

View abstract

Matsushita, K., Ning Ding, S. & Kim, E. 2018. **Cardio-ankle vascular index and cardiovascular disease: Systematic review and meta-analysis of prospective and cross-sectional studies**. The Journal of Clinical Hypertension 1–9.

AIM: to assess the association between Cardio-ankle vascular index (CAVI) and CVD.

METHOD: A systematic review. We searched for both prospective and cross-sectional studies using MEDLINE, Embase, and Cochrane from inception until April 11, 2017. We pooled the results using random-effects models.

RESULTS: Among 1519 records, we identified nine prospective studies (n = 5214) and 17 cross-sectional eligible studies (n=7309), with most enrolling high CVD risk populations in Asia. All nine prospective studies investigated composite CVD events as an outcome (498 cases including coronary events and stroke) but modeled CAVI inconsistently. The pooled adjusted hazard ratio for CVD events per 1 standard deviation increment of CAVI in four studies was 1.20 (95% CI: 1.05-1.36, P= 0.006). Of the 17 cross-sectional studies, 13 studies compared CAVI values between patients with and without CVD and all reported significantly higher values in those with CVD (pooled mean difference in CAVI values 1.28 [ 0.86-1 .70] , P<0.001).

View full text

## Trials

Eliasson, M., Eriksson, M., Lundqvist, R., et al. 2018. **Comparison of trends in cardiovascular risk factors between two regions with and without a community and primary care prevention programme**. Eur J Prev Cardiol 25(16) 1765-1772

AIM: to compare time trends in CVD risk factors between two counties in Sweden, one receiving an individual and community-based public health programme, one without this programme.

METHOD: Between 1994 and 2014, five surveys were performed in the two counties on persons aged 40 to 75 years within the Northern Sweden MONICA Study. The number of subjects participating was 6600 (75.4%). We compared time trends in risk factors between the two counties using regression models including age, county

and year of survey. To test whether time trends differed between counties, the interaction between county and year was included in the models.

RESULTS: Systolic blood pressure declined in both counties, and the decline was faster in Vasterbotten than in Norrbotten ( p = 0.043 for interaction county*year). Diastolic blood pressure declined in VB but increased in NB ( p < 0.001). Cholesterol levels declined at a similar rate in both counties whereas body mass index increased in both counties. Fasting glucose decreased in VB ( p = 0.003) and increased in NB. The prevalence of regular smokers decreased faster in VB than in NB ( p = 0.01). Trend in waist and hip circumference, known diabetes, having an academic degree, being physically inactive or 10 year cardiovascular mortality according to SCORE did not differ.

View abstract

Strandberg, T. E., Räikkönen, K., Salomaa, V., et al. 2018. **Increased Mortality Despite Successful Multifactorial Cardiovascular Risk Reduction in Healthy Men: 40-Year Follow-Up of the Helsinki Businessmen Study Intervention Trial.** Journal of Nutrition, Health & Aging 22(8) 885-891

AIM: in a 5-year multifactorial risk reduction intervention for healthy men with at least one cardiovascular disease (CVD) risk factor, mortality was unexpectedly higher in the intervention than the control group during the first 15-year follow-up – in order to find explanations for the adverse outcome, we have extended mortality follow-up and examined in greater detail baseline characteristics that contributed to total mortality.

METHOD: Long-term follow-up of a controlled intervention trial. Setting: The Helsinki Businessmen Study Intervention Trial. Participants and Intervention: The prevention trial between 1974-1980 included 1,222 initially healthy men (born 1919-1934) at high CVD risk, who were randomly allocated into intervention (n=612) and control groups (n=610). The 5-year multifactorial intervention consisted of personal health education and contemporary drug treatments for dyslipidemia and hypertension. In the present analysis we used previously unpublished data on baseline risk factors and lifestyle characteristics. Main outcome measures: 40-year total and cause-specific mortality through linkage to nation-wide death registers.

RESULTS: The study groups were practically identical at baseline in 1974, and the 5-year intervention significantly improved risk factors (body mass index, blood pressure, serum lipids and glucose), and total CVD risk by 46% in the intervention group. Despite this, total mortality has been consistently higher up to 25 years post-trial in the intervention group than the control group, and converging thereafter. Increased mortality risk was driven by CVD and accidental deaths. Of the newly-analysed baseline factors, there was a significant interaction for mortality between intervention group and yearly vacation time (P=0.027): shorter vacation was associated with excess 30-year mortality in the intervention (hazard ratio 1.37, 95% CI 1.03-1.83, P=0.03), but not in the control group (P=0.5). This finding was robust to multivariable adjustments.

View abstract

Wong, C. K. H., Siu, S.-C., Wong, K.-W., et al. 2018. **Five-year effectiveness of short messaging service (SMS) for pre-diabetes.** BMC research notes 11(1) 709

AIM: to evaluate the long-term sustainability and maintenance of improved glycemic control, lipid profile, reduced progression to diabetes at 3-year following a 2-year short messaging service (SMS).

METHOD: An observational post-randomized controlled trial (RCT) design was adopted. We performed a naturalistic follow-up to the 104 participants of SMS intervention, a 2-year randomized controlled trial comparing the SMS to non-SMS for pre-diabetes. All participants were arranged screening for diabetes at 5-year assessment. Primary outcome of this post-RCT study was cumulative incidence of diabetes whereas secondary outcomes were the change in biometric data over a 5-year period.

RESULTS: After a mean 57-month follow-up, 19 (18.3%) were lost to follow-up after the RCT period. Progression to diabetes occurred in 20 and 16 patients among the intervention and control group respectively, with no significant between-group difference (8.06 and 7.31 cases per 100 person years, respectively; Hazard Ratio in the intervention group, 1.184; 95% confidence interval, 0.612 to 2.288; p-value = 0.616). No significant effect of SMS on reduction in diabetes was observed in overall and pre-defined subgroups.

View full text

## Cohort studies

Balata, H., Knight, S. B., Barber, P., et al. 2018. **Targeted lung cancer screening selects individuals at high risk of cardiovascular disease.** Lung Cancer 124 148

AIM: to determine whether a brief CV risk assessment, delivered as part of a community-based lung cancer screening programme, was effective in identifying individuals at high risk who might benefit from primary prevention.

METHOD: The Manchester Lung Screening Pilot consisted of annual low dose CT (LDCT) over 2 screening rounds, targeted at individuals in deprived areas at high risk of lung cancer (age 55-74 and 6-year risk >=1.51%, using PLCOM2012 risk model). All participants of the second screening round were eligible to take part in the study. Ten-year CV risk was estimated using QRISK2 in participants without CVD and compared to age (+/-5 years) and sex matched Health Survey for England (HSE) controls; high risk was defined as QRISK2 score >=10%. Coronary artery calcification (CAC) was assessed on LDCT scans and compared to QRISK2 score.

RESULTS: Seventy-seven percent (n=920/1,194) of screening attendees were included in the analysis; mean age 65.6+/-5.4 and 50.4% female. QRISK2 and lung cancer risk (PLCOM2012) scores were correlated (r=0.26, p<0.001). Median QRISK2 score was 21.1% (IQR 14.9-29.6) in those without established CVD (77.6%, n=714/920), double that of HSE controls (10.3%, IQR 6.6-16.2; n=714) (p<0.001). QRISK2 score was significantly higher in those with CAC (p<0.001). Screening attendees were 10-fold more likely to be classified high risk (OR 10.2 [95% CI 7.3-14.0]). One third (33.7%, n=310/920) of all study participants were high risk but not receiving statin therapy for primary CVD prevention.

View abstract

## Cross-sectional

Bali, V., Yermilov, I., Koyama, A., et al. 2018. **Secondary prevention of diabetes through workplace health screening.** Occupational medicine (Oxford, England).

AIM: to evaluate the association between workplace diabetes screening, subsequent diagnosis and changes in fasting plasma glucose (FPG), glycated haemoglobin (HbA1c) and body mass index (BMI) among individuals who screened positive for diabetes.

METHOD: Employees without a prior diagnosis of diabetes participated in workplace health screening by 45 employers throughout the USA. Individuals screened positive for diabetes based on standard criteria (>=126 mg/dL FPG or >=6.5% [48 mmol/mol] HbA1c). Diabetes diagnoses were identified after screening using claims-based ICD9-CM diagnosis codes. Discrete-time survival analysis estimated the monthly rate of new diabetes cases after screening, relative to the time period before screening. Paired t-tests evaluated 1-year changes in blood glucose measures and BMI among individuals with positive screenings.

RESULTS: Of 22790 participating individuals, 900 (4%) screened positive for diabetes. A significantly greater rate of new diabetes diagnoses was observed during the first month after screening, compared to the 3-month period before screening (odds ratio [OR] 2.65, 95% confidence intervals [CIs] 2.02-3.47). Among 538 individuals with diabetes who returned for workplace screening 1 year later, significant improvements were observed in BMI (mean +/- SD = -0.63 +/- 2.56 kg/m2, P < 0.001) and FPG levels (mean +/- SD = -9.3 +/- 66.5 mg/dL, P < 0.01)., View abstract

Harry, M. L., Saman, D. M., Allen, C. I., et al. 2018. **Understanding Primary Care Provider Attitudes and Behaviors Regarding Cardiovascular Disease Risk and Diabetes Prevention in the Northern Midwest**. Clinical diabetes : a publication of the American Diabetes Association 36(4) 283-294

AIM: to fill critical gaps in understanding primary care providers' (PCPs') beliefs regarding diabetes prevention and cardiovascular disease risk in the prediabetes population, including through comparison of attitudes between rural and non-rural PCPs.

METHOD: We used data from a 2016 cross-sectional survey sent to 299 PCPs practicing in 36 primary clinics that are part of a randomized control trial in a predominately rural northern Midwestern integrated health care system.

RESULTS: a few significant, but clinically marginal, differences between rural and non-rural PCPs. Generally, PCPs agreed with the importance of screening for prediabetes and thoroughly and clearly discussing CV risk with high-risk patients.

View abstract

Kalia, S., Greiver, M., Zhao, X., et al. 2018. **Would you like to add a weight after this blood pressure, doctor? Discovery of potentially actionable associations between the provision of multiple screens in primary care**. Journal of Evaluation in Clinical Practice 24(2) 423-430

AIM: to discover and rank associations between the presence of screens to plan more efficient prompts in primary care.

METHODS: Risk factors with the greatest impact on chronic diseases are associated with blood pressure, body mass index, waist circumference, glycaemic and lipid levels, smoking, alcohol use, diet, and exercise. We looked for associations between the presence of screens for these in electronic medical records. We used association rule

mining to describe relationships among items, factor analysis to find latent categories, and Cronbach α to quantify consistency within latent categories.

RESULTS: Data from 92 140 patients in or around Toronto, Ontario, were included. We found positive correlations (lift &gt;1) between the presence of all screens. The presence of any screen was associated with confidence greater than 80% that other data on items with high prevalence (blood pressure, glycaemic and lipid levels, or smoking) would also be present. A cluster of rules predicting the presence of blood pressure were ranked highest using measures of interestingness such as standardized lift. We found 3 latent categories using factor analysis; these were laboratory tests, vital signs, and lifestyle factors; Cronbach α ranged between .58 for lifestyle factors and .88 for laboratory tests.

View full text


Shahim, B., Hasselberg, S., Boldt-Christmas, O., et al. 2018. **Effectiveness of different outreach strategies to identify individuals at high risk of diabetes in a heterogeneous population: a study in the Swedish municipality of Sodertalje.** European journal of preventive cardiology.

AIM: to identify the best strategy to reach individuals at high risk of T2DM and thereby cardiovascular disease in a heterogeneous population.

METHODS: All 18-65-year-old inhabitants in the Swedish municipality of Sodertalje ( n~51,000) without known T2DM and cardiovascular disease were encouraged to complete the Finnish Diabetes Risk Score (FINDRISC: score > 15 indicating a high and > 20 a very high risk of future T2DM and cardiovascular disease) through the following communication channels: primary care centres, workplaces, Syrian orthodox churches, pharmacies, crowded public places, mass media, social media and mail. Data collection lasted for six weeks.

RESULTS: The highest response rate was obtained through workplaces (27%) and the largest proportion of respondents at high/very high risk through the Syrian orthodox churches (18%). The proportion reached through primary care centres was 4%, of whom 5% were at elevated risk. The cost of identifying a person at elevated risk through the Syrian orthodox church was 104 compared with 8 through workplaces and 112 through primary care centres.

View abstract


Xu, L., He, R., Hua, X., et al. 2018. **The value of ankle-branchial index screening for cardiovascular disease in type 2 diabetes**. Diabetes/metabolism research and reviews

AIM: to investigate the relationship between ankle-branchial index (ABI) and cardiovascular disease in type 2 diabetes patients.

METHOD: A total of 634 inpatients with type 2 diabetes were recruited in this cross-sectional study. All patients were measured with ABI and computed tomography angiography (CTA) scan for coronary artery disease (CAD). According to ABI values, patients were divided into three groups: low-ABI group (ABI < 0.9, n = 259), normal-ABI group (ABI = 0.9-1.3, n = 272), and high-ABI group (ABI > 1.3, n = 103). According to the manifestation of coronary CTA, the patients were divided into CAD group (n = 348) and non-CAD group (n = 286). Their clinical data and biochemical parameters were compared and analysed.

RESULTS: The prevalence of CAD in low-ABI group (90%) was significantly higher than that of normal-ABI group (33%) and high-ABI group (25%) (both P < 0.01). Spearman correlation analysis showed that age, sex, duration, spontaneous bacterial peritonitis, total cholesterol (TC), triglyceride, low-density lipoprotein cholesterol (LDL-C), serum creatinine, and glycosylated haemoglobin (HbA1c ) were positively correlated with CAD, and high-density lipoprotein cholesterol (HDL-C), glomerular filtration rate, and ABI were negatively correlated with CAD. Logistic regression analysis further revealed that age, sex, duration, TC, HDL-C, LDL-C, HbA1c , and ABI were independent risk factors of CAD. After all potential confounders is adjusted, the risk of CAD in low-ABI group still increased over four times than the normal-ABI group (odds ratio [OR], 5.32; 95% CI, 1.973-16.5; P < 0.001). In female patients, this risk increased more than nine times (OR, 10.63; 95% CI, 3.416-17.8; P < 0.001). Receiver-operating characteristic analysis indicated that ABI < 1.045 predicted the occurrence of CAD (sensitivity, 79.7%; specificity, 71.5%; P < 0.01).

View full text

## Qualitative

Marshall, I. J., Wolfe, C. D. A. & McKevitt, C. 2018. '**People like you?': how people with hypertension make sense of future cardiovascular risk-a qualitative study.** BMJ open 8(11) e023726

AIM: to understand the perspectives of patients with hypertension on their future risk of CVD.

METHOD: Qualitative, semistructured interviews and thematic analysis., PARTICIPANTS: People with hypertension who had not experienced a cardiovascular event recruited from primary care., SETTING: Participants were

purposively sampled from two primary care practices in South London. Interviews were transcribed, and a thematic analysis was conducted.

RESULTS: 24 people participated; participants were diverse in age, sex, ethnicity and socioeconomic status. Younger working-aged people were under-represented. Contrasting with probabilistic risk, many participants understood future CVD as binary and unknowable. Roughly half of participants avoided contemplating future CVD risk; for some, lifestyle change and medication obviated the need to think about CVD risk. Some participants identified with one portion of the probability fraction ('I'd be one of those ones.'). Comparison with peers (typically partners, siblings and friends of a similar age, including both 'healthy' and 'unhealthy' people) was most frequently used to describe risk, both among those who engaged with and avoided risk discussion. This contrasts with current risk scores, which describe probabilities in people with similar risk factors; many participants did not identify with such a group, and hence did not find these probabilities meaningful, even where correctly understood.

View full text

## Modelling studies

Linder, S., Marko, D., Tian, Y., et al. 2018. **A Population-Based Approach to Mapping Vulnerability to Diabetes.** International journal of environmental research and public health 15(10)

AIM: to introduce a non-parametric, population-based approach to defining and measuring vulnerability to diabetes that will capture its composite features in biologic, socio-demographic and social determinants terms

METHOD: Cluster analysis.

RESULTS: Cluster analysis identified three multivariate profiles of adult residents with type 2 diabetes, based on 35 socioeconomic indicators. The undiagnosed population was screened for vulnerability based on their resemblance or fit to these multivariate profiles. Geographic neighborhoods with high concentrations of "vulnerables" could then be identified. In parallel, recursive partitioning found the best predictors of type 2 diabetes in this urban population, combined them with indicators of disadvantage, and applied them to residents in the selected neighborhoods to establish relative levels of composite vulnerability. Neighborhoods with high concentrations of residents manifesting composite vulnerability can be easily identified for targeting community-based prevention measures.

View full text

## Ongoing research

AlshehriI A, Jalal Z and Yahyouche A. 2018. **Pharmacist interventions in prevention of cardiovascular diseases in general practice: a systematic review and meta-analysis of randomised controlled trials**. PROSPERO 2018 CRD42018107132.

AIM: to investigate the current role of general practice-based pharmacists in the prevention of Cardiovascular Diseases

METHOD: A systemic search of the literature will be undertaken in eight electronic databases: PubMed (NCBI), Ovid MEDLINE (1946), EMBASE (1974), PsycINFO (1967), Cochrane Library (Wiley), CINAHL Plus (EBSCO) (1937), Scopus (ELSEVIER) and Science Citation Index Expanded (Web of Science Core Collection) (1900) from inception. Studies will be included if they are randomised controlled trials or cluster-randomised trials assessing the effectiveness of interventions delivered in general practice by only or mainly a pharmacist. The pharmacist interventions will be included if they are patient focused intervention including at least one of the medical cardiovascular disease risk factors, mainly hypertension, type 2 diabetes mellitus and dyslipidaemia. Studies will be included if they had a comparison with usual care.

View details