NHS Health Check programme:
Annotated Bibliography: November 8th 2019 – April 27th 2020

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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.

Previous searches had identified references from between January 1st 1996 and November 8th 2019. This search identifies references from November 8th 2020 until April 27th 2020. The cut-off date for internet searches was April 28th 2020**.**

Table 1. Search strategies

Database	Search strategy
Ovid Medline	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. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 14. cardiovascular adj3 prevention.tw. 15. (primary care or general practice or primary healthcare).tw 16. 14 and 15 17. Cardiovascular Diseases/ AND Primary Prevention/ 18. 16 or 17 19. 13 or 18 20. limit 19 to dt=20191108-20200427
PubMed	1. health check* 2. diabetes screen* 3. cardiovascular screen* 4. population screen* 5. risk factor screen* 6. opportunistic screen* 7. medical check* 8. general check* 9. periodic health exam* 10. annual exam* 11. annual review* 12. NHSHC 13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 9 or 10 or 11 or 12 14. Cardiovascular Diseases AND Primary Prevention[MeSH Terms] 15. "primary care"[Text Word] OR "general practice"[Text Word] OR "primary healthcare"[Text Word]) 16. (cardiovascular[Text Word] AND prevention[Text Word]) 17. #15 and #16 18. #14 or #17 19. #13 or #18 Filters: Publication date from 2019/11/08 to 2020/04/27

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 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=20191108-20200427

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="2019-2020"

EBSCO CINAHL	S12 S10 AND S11
	S11 S1 OR S2 OR S9
	S10 EM 20191108-20200427
	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: 2019-2020
	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 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=20191108-20200427

Cochrane Library (Wiley)	#1 "health check*" #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 #3 cardiovascular adj3 prevention.tw. #4 (primary care or general practice or primary healthcare).tw #5 #3 and #4 #6 MeSH descriptor: [Cardiovascular Diseases] this term only #7 MeSH descriptor: [Primary Prevention] explode all trees #8 #6 and #7 #9 #5 or #8 #10 #1 or #2 or #9 with Cochrane Library publication date from Nov 2019 to May 2020
NHS Evidence	"*health check*" OR *cardiovascular prevention primary* Limited to 08/11/2019 to 27/04/2020
TRIP database	*(title:cardiovascular prevention primary from:2019) OR ("nhs health check" from:2019)*
Google Scholar	*"nhs health check" OR* *cardiovascular "health check" OR* *cardiovascular prevention primary care OR* *nhs health check program* Since 2019, sorted by date.
Google	"*nhs health check*" *cardiovascular prevention "primary care"* *cardiovascular "health check"* *CVD risk prediction* *nhs health check program* Limited to 08/11/2019 to 27/04/2020
Clinical trials.gov, ISRCTN, Prospero	*"health check",* Limited to 08/11/2019 to 27/04/2020

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 Nov 8th 2019 and April 27th 2020

Database	No. of hits	Exclusive (non duplicates)
Ovid Medline (April 24th 2020)	1080	1066
PubMed (27th April 2020)	448	56
Ovid Embase (2020 wk 17)	2037	1156
Ovid HMIC (March 2020)	30	27
EBSCO CINAHL (Nov 8th 2019-Apr 27th 2020)	933	791
EBSCO Global Health (Nov 8th 2019-Apr 27th 2020)	754	645
Ovid PsycInfo (nov 8th to April week 3 2020)	164	138
Cochrane Library (Issue 4 of 12, April 2020)	76	37
NICE Evidence (Nov 8th 2019 to Apr 27th 2020)	50	45
TRIP database (since 2019)	77	56
TOTAL		**4017**

Table 2a. Citations added to internet sources between Nov 8th 2019 and April 28th 2020

Internet sources	No. of hits
Google Scholar (2019)	2
Google (May 1st 2019 – Nov 11th 2019)	3
Trials registers, Prospero (2019)	1
TOTAL	**6**

From these 4023 results, 8 were identified as being relevant to the NHS Health Check programme, 13 to general health checks and 74 to diabetes/cardiovascular disease risk screening.

Total relevant references = 95
- **NHS Health Checks = 8**
- **general health checks = 13**
- **diabetes/cardiovascular disease screening = 74**

4.   References on the NHS Health Check Programme (8)

Systematic reviews

Bunten, A., Porter, L., Gold, N., et al. 2020. **A systematic review of factors influencing NHS health check uptake: invitation methods, patient characteristics, and the impact of interventions**. BMC Public Health 20(1) 93.

AIM: to highlight interventions and invitation methods that increase the uptake of NHSHCs, and to identify whether the effectiveness of these interact with broader patient and contextual factors.

METHOD: A systematic review was conducted according to the PRISMA checklist. Papers were eligible if they explored the impact of at least one of (i) interventions, (ii) invitation methods or (iii) broader factors on NHSHC uptake. Ten databases were searched in January 2016 and seven were searched in March 2018. Nine-hundred-and-forty-five papers were identified, 238 were screened and 64 full texts were assessed for eligibility. Nine studies were included in the review.

RESULTS: The nine studies were all from peer reviewed journals. They included two randomised controlled trials, one observational cohort and six cross-sectional studies. Different invitation methods may be more effective for different groups of patients based on their ethnicity and gender. One intervention to enhance invitation letters effectively increased uptake but another did not. In addition, individual patient characteristics (such as age, gender, ethnicity and risk level) were found to influence uptake. This review also finds that uptake varies significantly by GP practice, which could be due either to unidentified practice-level factors or deprivation.

CONCLUSIONS: Further research is needed to assess the effectiveness of different invitation methods for different population groups. Research should examine how existing invitation methods can be enhanced to drive uptake whilst reducing health inequalities.

View full text

Trials

Hardeman, W., Mitchell, J., Pears, S., et al. 2020. **Evaluation of a very brief pedometer-based physical activity intervention delivered in NHS Health Checks in England: The VBI randomised controlled trial**. PLoS Medicine / Public Library of Science 17(3) e1003046.

AIM: to assess the effectiveness and cost-effectiveness of a very brief (5-minute) pedometer-based intervention ('Step It Up') delivered as part of National Health Service (NHS) Health Checks in primary care.

METHODS: The Very Brief Intervention (VBI) Trial was a two parallel-group, randomised controlled trial (RCT) with 3-month follow-up, conducted in 23 primary care practices in the East of England. Participants were 1,007 healthy adults aged 40 to 74 years eligible for an NHS Health Check. They were randomly allocated (1:1) using a web-based tool between October 1, 2014, and December 31, 2015, to either intervention (505) or control group (502), stratified by primary care practice. Participants were aware of study group allocation. Control participants received the NHS Health Check only. Intervention participants additionally received Step It Up: a 5-minute face-to-face discussion, written materials, pedometer, and step chart. The primary outcome was accelerometer-based physical activity volume at 3-month follow-up adjusted for sex, 5-year age group, and general practice. Secondary outcomes included time spent in different intensities of physical activity, self-reported physical activity, and economic measures.

RESULTS: Participants ' mean age was 56 years, two-thirds were female, they were predominantly white, and two-thirds were in paid employment. The primary outcome was available in 859 (85.3%) participants. There was no significant between-group difference in activity volume at 3 months (adjusted intervention effect 8.8 counts per minute [cpm]; 95% CI -18.7 to 36.3; $p = 0.53$). We found no significant between-group differences in the secondary outcomes of step counts per day, time

spent in moderate or vigorous activity, time spent in vigorous activity, and time spent in moderate-intensity activity (accelerometer-derived variables); as well as in total physical activity, home-based activity, work-based activity, leisure-based activity, commuting physical activity, and screen or TV time (self-reported physical activity variables). Of the 505 intervention participants, 491 (97%) received the Step it Up intervention. Analysis of 37 intervention consultations showed that 60% of Step it Up components were delivered faithfully. The intervention cost 18.04 per participant. Incremental cost to the NHS per 1,000-step increase per day was 96 and to society was 239. Adverse events were reported by 5 intervention participants (of which 2 were serious) and 5 control participants (of which 2 were serious).

CONCLUSIONS: In this large well-conducted trial, we found no evidence of effect of a plausible very brief pedometer intervention embedded in NHS Health Checks on objectively measured activity at 3-month follow-up.

View full text

Gold, N., Durlik, C., Sanders, J. G., et al. 2019. **Applying behavioural science to increase uptake of the NHS Health Check: a randomised controlled trial of gain- and loss-framed messaging in the national patient information leaflet**. BMC Public Health 19(1) 1519.

AIM: to assess the impact on uptake of two new behaviourally-enhanced leaflets (with the current national leaflet as a control), enclosed with the invitation letter: the first trial on the leaflet.

METHODS: A double-blind three-armed randomized controlled trial was conducted. The new leaflets were shorter (two pages, instead of four); one was loss-framed ('don't miss out') and the other was gain-framed ('make the most of life'). The participants were patients from 39 practices in Lewisham and 17 practices in NE Lincolnshire, who were allocated to interventions using a random-number generator and received one of the leaflets with their invitation letter from April-September 2018. The outcome measure was uptake of an NHSHC by November 2018. The trial was powered to detect a 2% effect.

RESULTS: Uptake was 17.6% in the control condition (n = 3677), 17.4% in the loss-framed condition (n = 3664), and 18.2% in the gain-framed condition (n = 3697). Leaflet type was not a significant predictor of NHSHC uptake in a logistic regression that controlled for demographic variables, with GP practice as a random effect. Statistically significant predictors of uptake included location (higher uptake in Lewisham), age (increased age was associated with increased attendance) and sex (higher uptake in females). The Bayes Factor comparing the null to a hypothesis of differences between conditions was 416, which is extreme evidence in favour of the null hypothesis.

CONCLUSION: There was no evidence for a meaningful effect of either a loss-framed or gain-framed behaviourally-informed leaflet type on uptake, which is surprising, given that behaviourally informed letters have improved uptake of NHSHCs. It is possible that people do not pay attention to leaflets that are enclosed with letters, or that the leaflet continues to support informed decision-making but this does not affect uptake.

View full text

Sallis, A., Gold, N., Agbebiyi, A., et al. 2019. **Increasing uptake of National Health Service Health Checks in primary care: a pragmatic randomized controlled trial of enhanced invitation letters in Northamptonshire, England**. Journal of Public Health 16 16.

AIM: to increase their uptake using behaviourally informed invitation letters.

METHOD: Patients registered with 6 general practices in Northamptonshire, England who were eligible for an NHSHC between 10 February 2014 and 31 January 2015 were randomized monthly, using a random number generator, to three trial arms: control (standard invitation), sunk costs (resources already allocated) and counterargument (against common barriers to attendance). The outcome measure was uptake of NHSHC by 12 weeks after 31 January.

RESULTS: In total, 6331 patients were randomized. After exclusions, due to ineligibility for the NHSHC, data were analysed for N = 6313 patients: N = 2123 control; N = 2085 counterargument; N = 2105 sunk costs. Overall, 2364 (37.45%) patients attended an NHSHC. Both intervention letters

increased uptake compared to control, by 5.46% using counterargument (adjusted odds ratio (AOR) 1.32, CI 1.162-1.51, p < 0.001) and 4.33% using sunk costs (AOR 1.246, CI 1.10-1.42, p < 0.001), with no significant difference between the two.

CONCLUSION: Behaviourally informed invitation letters, containing sunk costs or counterargument messages, can improve the uptake of NHSHCs.

View full text

Cohort studies

Palladino, R., Vamos, E. P., Chang, K. C., et al. 2020. **Evaluation of the Diabetes Screening Component of a National Cardiovascular Risk Assessment Programme in England: a Retrospective Cohort Study**. Scientific Reports 10(1) 1231.

AIM: to assess associations between coverage of a national cardiovascular and diabetes risk assessment programme in England (NHS Health Check) and detection and management of incident cases of non-diabetic hyperglycaemia (NDH) and T2D.

METHODS: Retrospective analysis employing propensity score covariate adjustment method of prospectively collected data of 348,987 individuals aged 40-74 years and registered with 455 general practices in England (January 2009-May 2016). We examined differences in diagnosis of NDH and T2D, and changes in blood glucose levels and cardiovascular risk score between individuals registered with general practices with different levels (tertiles) of programme coverage.

RESULTS: Over the study period 7,126 cases of NDH and 12,171 cases of T2D were detected. Compared with low coverage practices, incidence rate of detection in medium and high coverage practices were 15% and 19% higher for NDH and 10% and 9% higher for T2D, respectively. Individuals with NDH in high coverage practices had 0.2 mmol/L lower mean fasting plasma glucose and 0.9% lower cardiovascular risk score at follow-up.

CONCLUSION: General practices actively participating in the programme had higher detection of NDH and T2D and improved management of blood glucose and cardiovascular risk factors.

View full text

Whittaker, P. J. 2019. **Uptake of cardiovascular health checks in community pharmacy versus general practice**. Journal of Pharmacy Practice and Research 49(6) 561-566.

AIM: to compare the uptake of NHS Health Checks for two matched primary care practice populations, one being offered NHS Health Checks within the primary care practice and the other being invited to attend a community pharmacy

METHODS: Eligible patients from two matched primary care practices were offered NHS Health Checks, one group in their own general practice and the other at a local community pharmacy. The number of patients invited and number of NHS Health Checks performed was compared from 1 April 2015 to 31 March 2016 inclusive.

RESULTS: In all, 2265 eligible patients were invited by letter to book an NHS Health Check, 1000 at a community pharmacy and 1265 at their own primary care practice. Of these, 264 people (21%) attended the primary care practice and 234 people (23%) attended a community pharmacy (p = 0.075).

CONCLUSION: Offering NHS Health Checks in a community pharmacy is a viable alternative to performing checks in general practice.

View full text

Cross-sectional studies

Chang, K. C. M., Vamos, E. P., Palladino, R., et al. 2019. **Impact of the NHS Health Check on inequalities in cardiovascular disease risk: a difference-in-differences matching analysis**. Journal of epidemiology and community health 73(1) 11-18.

AIM: to assess impacts of a large, nationwide cardiovascular disease (CVD) risk assessment and management programme on sociodemographic group inequalities in (1) early identification of

hypertension, type 2 diabetes (T2D) and chronic kidney disease (CKD); and (2) management of global CVD risk among high-risk individuals.

METHODS: We obtained retrospective electronic medical records from the Clinical Practice Research Datalink for a randomly selected sample of 138788 patients aged 40-74 years without known CVD or diabetes, who were registered with 462 practices between 2009 and 2013. We estimated programme impact using a difference-in-differences matching analysis that compared changes in outcome over time between attendees and non-attendees.

RESULTS: National Health Service Health Check attendance was 21.4% (29 672/138 788). A significantly greater number of hypertension and T2D incident cases were identified in men than women (eg, an additional 4.02%, 95%CI 3.65% to 4.39%, and 2.08%, 1.81% to 2.35% cases of hypertension in men and women, respectively). A significantly greater number of T2D incident cases were identified among attendees living in the most deprived areas, but no differences were found for hypertension and CKD across socioeconomic groups. No major differences in CVD risk management were observed between sociodemographic subgroups (eg, programme impact on 10-year CVD risk score was -1.13%, -1.48% to -0.78% in male and -1.53%, -2.36% to -0.71% in female attendees).

CONCLUSION: During 2009-2013, the programme had low attendance and small overall impacts on early identification of disease and risk management. The age, sex and socioeconomic subgroups appeared to have derived similar level of benefits, leaving existing inequalities unchanged. These findings highlight the importance of population-wide interventions to address inequalities in CVD outcomes.

View full text

Ongoing research

Wong, G., Duddy, C., Gadsby, E., et al. 2020. **NHS Health Check programme: a realist review**. PROSPERO CRD42020163822. April 1st.

AIM: to understand how the NHS Health Check programme works in different settings, for different groups, in order to recommend improvements to maximise intended outcomes.

METHODS: Several recent reviews have employed comprehensive search strategies developed by Public Health England to identify evidence relating to NHS Health Check published until November 2016. We will not duplicate this work, but will extend it, undertaking updated searches to capture more recent evidence, and considering additional databases for inclusion. Specifically, this will include opinion, commentary pieces and abstracts submitted to multiple NHS Health Check conferences or additional information uploaded to the NHS Health Check website. These additional searches will identify more grey literature, such as policy documentation and evaluation reports, which are likely to provide more detailed local contextual information. Finally we will conduct further searches of relevant current and archived websites (including the Department of Health, NHS England and local Clinical Commissioning Group (CCG) websites). In addition, we will seek access to unpublished evaluation reports by contacting local public health teams directly.

RESULTS: Data analysis will use a realist logic of analysis. We will use interpretive cross-case comparison to understand and explain how and why observed outcomes have occurred, for example, by comparing settings where the NHS Health Checks programme has been reported as being 'successful' against those which have not, to understand how context has influenced reported findings. Anticipated completion date: 30 June 2021

View protocol

References relating to general health checks (13)

Evidence summaries

Smith, D. K., Schmidt, H. S. & Saint, C. M. 2019. **General Health Checks in Adults for Reducing Disease-Related Morbidity and Mortality**. American Family Physician 100(11) 676-677.
AIM: to summarise a Cochrane review on whether general health checks in adults reduce illness and death
METHODS: a summary of an exisiting Cochrane review
RESULTS AND CONCLUSION: General health check visits have no benefit on cardiovascular morbidity or on total, cardiovascular, or cancer-related mortality. There is also no evidence that they cause patient harm
View abstract

Cohort studies

Mitsutake, S., Ishizaki, T., Tsuchiya-Ito, R., et al. 2020. **Association of pharmacological treatments for hypertension, diabetes, and dyslipidemia with health checkup participation and identification of disease control factors among older adults in Tokyo, Japan**. Preventive Medicine Reports 17 101033.
AIM: to evaluate the associations of pharmacological treatments for these diseases with health checkup participation and identify the disease control factors among patients receiving treatments.
METHODS: Using medical claims data and health checkup data between September 2013 and August 2014 from 820,215 older adults aged >= 75 years residing in Tokyo, Japan, we examined the associations between pharmacological treatments and health checkup participation using binary logistic regression analysis. Next, patients receiving pharmacological treatments were categorized into intensive, moderate, or limited disease control based on their blood pressure, hemoglobin A1c levels, and lipid levels; multinomial logistic regression analyses were used to identify the disease control factors.
RESULTS: The results showed that patients receiving pharmacological treatments were more likely (odds ratio: 1.374; P < 0.001) to participate in health checkups than patients not receiving treatments. Patients with intensive disease control were more likely to be aged >= 90 years and use home medical care than patients with moderate control.
CONCLUSION: Our findings suggest that it may be beneficial to shift the focus of health checkups from simply identifying at-risk patients to also supporting disease management. Information obtained from databases that link medical claims and health checkup data may improve evaluations of disease control in older adults and help to streamline healthcare systems.
View full text

Itoh, H., Kaneko, H., Kiriyama, H., et al. 2019. **Effect of Body Weight Change on Blood Pressure in a Japanese General Population with a Body Mass Index >/= 22 kg/m(2).** Int Heart J 60(6) 1381-1386.
AIM: to clarify the effect of body weight change on BP using a community-based cohort.
METHODS: We studied 1,170 overweight subjects with a body mass index (BMI) >/= 22 kg/m(2) who underwent health check-ups. Among the study subjects, 175 (15%) were categorized in the weight loss group (weight loss >/= 5%), 869 (74%) in the weight stable group, and 126 (11%) in the weight gain group (weight gain >/= 5%).
RESULTS: There were no significant differences in baseline BP between the 3 groups. In the weight loss group, systolic and diastolic BP, and the rates of stage 2 (systolic BP >/= 140 mmHg or diastolic BP >/= 90 mmHg) and stage 1 hypertension (130 mmHg</= systolic BP < 140 mmHg or 80 mmHg</=

diastolic BP < 90 mmHg) decreased. In contrast, in the weight gain group, systolic and diastolic BP and the rate of stage 2 hypertension increased. Subgroup analysis showed that the correlation between change in body weight and BP was seen in each subgroup according to age, sex, and BMI. CONCLUSION: The results of the present study suggest the significance of body weight control for BP control in subjects with BMI >/= 22 kg/m(2).
View full text

Nagai, K., Yamagata, K., Iseki, K., et al. 2019. **Cause-specific mortality in the general population with transient dipstick-proteinuria.** PLoS ONE 14(10) e0223005-e0223005.
AIM: to evaluate a general-population cohort who received annual health checkups, with a median 4.3-year study period.
METHODS: a longitudinal study of 338,094 persons in Japan, using data on age, sex, body mass index (BMI), systolic blood pressure, diastolic blood pressure, smoking habit, and use of antihypertensive drugs, lipid-lowering drugs, and hypoglycemic drugs (obtained via self-reported questionnaire), the results of dipstick urinalysis for proteinuria and serological testing for serum creatinine concentration, and serum lipid status.
RESULTS: There were 2,481 deaths, including 510 CVD deaths (20.6%) and 1,328 cancer deaths (53.5%), and mortality risk was evaluated for transient proteinuria and for transiently reduced renal function. The hazard ratios (HRs) for all-cause mortality and cancer mortality were not significant, but that for cardiovascular mortality was significantly higher for transient proteinuria (HR, 1.94 [95% confidence interval, 1.27-2.96] in men and 2.78 [1.50-5.16] in women). On the other hand, transiently reduced renal function was not significant for either cardiovascular mortality risk or cancer mortality risk.
CONCLUSION: We surmise that this is the first study of the mortality risk of transient dipstick proteinuria in a large general-population cohort with cause-specific death registration. Transiently positive proteinuria appears to be a significant risk specifically for cardiovascular mortality compared with definitely negative for proteinuria.
View full text

Wilson, R., Kuh, D. & Stafford, M. 2019. **Variations of health check attendance in later life: results from a British birth cohort study.** BMC Public Health 19(1) 1518.
AIM: to assess associations between factors from childhood and adulthood, and health check attendance in later life in a British birth cohort study.
METHODS: For 2370 study members from the MRC National Survey of Health and Development (NSHD), health check attendance was assessed at age 68. Study members were asked if they: attended blood pressure and cholesterol checks, had their eyes tested, received the influenza vaccine, attended colon cancer screening and dental checks. Health and social factors from childhood and adulthood were used in binomial regression models to test associations with health check attendance in men and women.
RESULTS: Health check attendance was high; 41% reported attending all six health checks within the recommended time frame. In multivariable models, being a non-smoker and having more health conditions in adulthood were associated with greater health check attendance in men and women. In women, childhood socioeconomic advantage, being more physically active in midlife and previously attending screening procedures, and in men, greater self-organisation in adolescence and being married were associated with attending more health checks in later life, following adjustments for childhood and adulthood factors.
CONCLUSIONS: A number of predisposing, enabling and need factors from childhood and adulthood were found to be associated with health check attendance at age 68, demonstrating the relevance of applying a life course perspective to Andersen's model in investigating health check attendance in later life. Health related factors were found to be stronger correlates of health check attendance than socioeconomic factors.
View full text

Cross-sectional studies

Blake, H., Somerset, S. & Evans, C. 2020. **Development and Fidelity Testing of the Test@Work Digital Toolkit for Employers on Workplace Health Checks and Opt-In HIV Testing**. International Journal of Environmental Research & Public Health [Electronic Resource] 17(1) 06.

AIM: to develop and evaluate a digital toolkit to facilitate employers' understanding about workplace health screening

METHODS: The Test@Work toolkit development included an online survey (STAGE 1: n = 201), stakeholder consultation (STAGE 2: n = 19), expert peer review (STAGE 3: n = 24), and pilot testing (STAGE 4: n = 20). The toolkit includes employer guidance on workplace health promotion, workplace health screening, and confidential opt-in HIV testing with signposting to resources. Pilot testing included assessment of fidelity (delivery and engagement) and implementation qualities (attitudes, resources, practicality, acceptability, usability and cost).

RESULTS: STAGE 1: The vast majority of respondents would consider offering general health checks in the workplace that included confidential opt-in HIV testing, and this view was broadly comparable across organisation types (n = 201; public: 87.8%; private: 89.7%; third: 87.1%). STAGES 2 and 3: Stakeholders highlighted essential content considerations: (1) inclusion of the business case for workplace health initiatives, (2) clear pathways to employer responsibilities, and (3) presenting HIV-related information alongside other areas of health. With regards presentation, stakeholders proposed that the toolkit should be concise, with clear signposting and be hosted on a trusted portal. STAGE 4: Employers were satisfied with the toolkit content, usability and utility. The toolkit had high fidelity with regards to delivery and employer engagement. Assessment of implementation qualities showed high usability and practicality, with low perceived burden for completion and acceptable cost implications. Very few resource challenges were reported, and the toolkit was considered to be appropriate for any type of organisation, irrespective of size or resources.

CONCLUSION: Employers perceived the Test@Work toolkit to be useful, meaningful and appropriate for their needs. This digital resource could be used to support employers to engage with health screening and opt-in HIV testing within the context of workplace health promotion.

View full text

Cheah, Y. K. & Meltzer, D. 2020. **Ethnic Differences in Participation in Medical Check-ups Among the Elderly: Evidence from Malaysia.** Journal of General Internal Medicine 17 17.

AIM To examine ethnic differences in participation in medical check-ups among the elderly.

METHODS: A nationally representative data set was employed. Multiple logistic regressions were utilised to examine the relationship between ethnicity and the likelihood of undergoing medical check-ups. The regressions were stratified by age, income, marital status, gender, household location, insurance access and health status. These variables were also controlled for in the regressions (including stratified regressions).The respondents were required to be residents of Malaysia and not be institutionalised. Overall, 30,806 individuals were selected to be interviewed, but only 28,650 were actually interviewed, equivalent to a 93% response rate. Of those, only 2248 were used in the analyses, because 26,402 were others or below aged 60.

RESULTS: Among the elderly aged 70-79 years, Chinese (aOR 1.89; 95% CI 1.28, 2.81) and Indians (aOR 2.39; 95% CI 1.20, 4.74) were more likely to undergo medical check-ups than Malays. Among the elderly with monthly incomes of <= RM999, Chinese (aOR 1.44; 95% CI 1.12, 1.85) and Indians (aOR 1.50; 95% CI 0.99, 2.28) were more likely to undergo medical check-ups than Malays. Indian males were more likely to undergo medical check-ups than Malay males (aOR 2.32; 95% CI 1.15, 4.67). Chinese with hypercholesterolaemia (aOR 1.45; 95% CI 1.07, 1.98) and hypertension (aOR 1.32; 95% CI 1.02, 1.72) were more likely to undergo medical check-ups than Malays.

CONCLUSION: There were ethnic differences in participation in medical check-ups among the elderly. These ethnic differences varied across age, income, marital status, gender, household location, insurance access and health status.

View full text

Naruse, M., Mukoyama, M., Morinaga, J., et al. 2020. **Usefulness of the quantitative measurement of urine protein at a community-based health checkup: a cross-sectional study**. Clinical and Experimental Nephrology 24(1) 45-52.

AIM: to evaluate the usefulness of urine protein/creatinine ratio (UPCR) measurements in community-based health checkups.

METHODS: We conducted UPCR measurements of 590 participants who showed a result of more than trace proteinuria on a dipstick analysis

RESULTS: The UPCR values increased in accordance with the severity of the dipstick test findings, but statistical significance was only obtained between (+/-) and (1+), between (+/-) and (2+), and between (+/-) and (3+) groups. When the participants with (+/-) proteinuria were subjected to CGA classification (a classification of CKD by cause, glomerular filtration rate category, and albuminuria category) according to their UPCR data, a significant proportion of subjects (277, 77.0%) moved from the A2 category into A1, which is a less severe category. Conversely, 21 subjects (5.8%) were reclassified into a more severe category (A3). Thus, a dipstick test may produce a non-negligible number of false negatives as well as a large number of false positives. Similarly, the classifications of more than half of the subjects with (1+) or more severe proteinuria were changed based on their UPCR results.

CONCLUSION: The dipstick urinalysis for proteinuria appears less reliable than expected, suggesting that the quantitative measurement of urine protein should be performed even during mass health checkups to ensure the early detection and prevention of CKD.

View full text

Hu, H., Kawasaki, Y., Kuwahara, K., et al. 2019. **Trajectories of body mass index and waist circumference before the onset of diabetes among people with prediabetes**. Clin Nutrition 25 25.

AIM: to investigate trajectories of body mass index (BMI) and waist circumference (WC) among prediabetic people who progressed to diabetes, people who remained with prediabetes, and those who returned to normoglycemia.

METHODS: We used data from 22,945 prediabetic people who received an annual health checkup for up to eight years. The development of diabetes was defined using the American Diabetes Association criteria. People who did not progress to diabetes during the observation period were classified as 'remained with prediabetes' or 'returned to normoglycemia', based on their last health checkup data. Trajectories of BMI and WC were evaluated using linear mixed models for repeated measures, with adjustment for a wide range of covariates.

RESULTS: During the study period, 2972 people progressed to diabetes, 4706 returned to normoglycemia, and 15,267 remained with prediabetes. People who progressed to diabetes had a larger increase in mean BMI from 7 years to 1 year prior to diagnosis, which was about three times that of people who remained with prediabetes (annual change rate, 0.20 [95% confidence interval; 0.15 to 0.24] vs 0.06 [0.04 to 0.08] kg/m^2 per year, P < 0.001), regardless of their BMI levels at the initial health checkup. Among people who returned to normoglycemia, mean BMI remained almost the same over time (-0.04 [-0.09 to 0.002] kg/m^2 per year), except for those with obesity (-0.16 [-0.28 to -0.05] kg/m^2 per year). As for WC, the annual change rate among people who developed diabetes was about 7 times that of people who remained with prediabetes (0.38 [0.32 to 0.45] vs 0.05 [0.03 to 0.08] cm per year, P < 0.001). We also observed a constant mean WC over time among people who had no central obesity and later returned to normoglycemia (-0.02 [-0.06 to 0.03] cm per year), and an annual decrease in mean WC among those who had central obesity and later returned to normoglycemia (-0.40 [-0.47 to -0.32] cm per year).

CONCLUSION: Our study provides strong evidence that avoiding weight gain could help prediabetic people minimize the risk of developing diabetes, regardless of whether they are obese. Losing weight could help obese people restore normoglycemia from a prediabetic state, whereas maintaining current weight may help nonobese people return to normoglycemia.

View full text

Diagnosis

Koga, M., Okuda, M., Inada, S., et al. 2020. **HbA1c levels measured by enzymatic assay during off-site health checkups are lower than those measured by on-site HPLC assay**. Diabetology International 11(1) 67-71.

AIM: to compare the HbA1c levels measured by an enzymatic assay (EA-HbA1c) off-site during health checkups with the HbA1c levels measured by on-site ion-exchange high-performance liquid chromatography (HPLC; HPLC-HbA1c) in a hospital.

METHODS: A total of 96 individuals (53 males and 43 females; age, 68.9 +/- 8.4 years old; 70 diabetic and 26 non-diabetic individuals) whose HbA1c levels were measured by both the methods listed above were included in the study. Since no HPLC-HbA1c levels were measured on the day of the health checkup, HPLC-HbA1c levels were estimated using HPLC-HbA1c levels measured before and after the health checkup.

RESULTS: A significant correlation of HbA1c levels was observed between the two groups (R = 0.973; p < 0.001). However, EA-HbA1c levels measured off-site during health checkups are lower than estimated HPLC-HbA1c levels measured on-site (6.37 +/- 0.75% vs. 6.69 +/- 0.75%; p < 0.001).

CONCLUSION: Since lower EA-HbA1c levels measured during health checkups, which diverged from on-site measurements, may lead to underestimating diabetes mellitus, accurate measurement of HbA1c is required irrespective of the measuring method. Further investigation of the cause of falsely low EA-HbA1c levels and the strategy for reconciling HbA1c to reflect plasma glucose accurately are warranted.

View full text

Qualitative

Larsen, L. B., Thilsing, T. & Pedersen, L. B. 2020. **Patient preferences for preventive health checks in Danish general practice: a discrete choice experiment among patients at high risk of noncommunicable diseases**. Family Practice 20 20.

AIM: to examine patient preferences for preventive health checks in Danish general practice, targeting persons at high risk of a noncommunicable disease.

METHODS: The method used in this study was a discrete choice experiment (DCE) with five attributes: assess, advice, agree, assist and arrange. The attributes were inspired by the 5A model for behaviour change counselling but was altered for the purpose of this study to grasp the entirety of the general practice-based intervention. Moreover, the attribute levels were defined to resemble daily clinical practice. The experimental design of the DCE was an efficient Bayesian main effects design and the results were analysed using a random utility theory framework.

RESULTS: A total of 148 patients completed the DCE. Patients at high risk of a noncommunicable disease have positive preferences for: giving brief explanations about own lifestyle, practicing shared decision-making with the general practitioner (GP), follow-up counselling with the GP after the preventive health check and scheduling a new appointment right after the preventive health check.

CONCLUSION: The results provide Danish GPs with evidence on their patients' preferences towards preventive health checks which will enable the GPs to tailor these consultations. Moreover, the results suggest that pre-appointment measures, such as a health profile, may mediate a preference for more action-oriented attributes.

View abstract

Ongoing research

Bevan, S and Jordan, R. 2019. **eTHOS: enhancing the health of NHS Staff. A trial to assess an employee health screening clinic for NHS staff**. ISRCTN .

AIM: to conduct a randomised controlled pilot trial of an employee health screening clinic for NHS staff

METHODS: All those randomised to the intervention arm will attend a staff health screening clinic. It will consist of two stages: (1) a screening assessment for musculoskeletal, mental and the NHS health check to eligible staff as per NHS Health check guidelines or a lifestyle check (BMI, exercise

levels, smoking, alcohol) to those who are not, followed by (2) appropriate advice and/or referral of screen positives to appropriate services for management as per NHS/NICE recommendations. All those randomised to the control arm will not attend a health screening clinic. Instead, if these participants have any health concerns they will be advised to see their GP or Occupational health department which is current usual care. Attendance at the screening clinic to complete intervention screening, and review of results and recommended action/referrals will approximately 40 minutes.
View protocol

Paldanius, S., Seilo, N., Kunttu, K., et al. 2020. **Screening University Students for Health Checks With an Electronic Health Questionnaire in Finland: Protocol for a Retrospective, Register-Based Cohort Study**. JMIR Research Protocols 9(1) e14535.
AIM: to evaluate the health examination process of university entrants. The objectives are to determine how students' self-reported health in the eHQ and participation in the health examination process are associated with graduation, mental health problems, and the use of student health care services.
METHODS: This is an ongoing, nationwide, retrospective, register-based cohort study with a 6-year follow-up. The study population is the cohort of university entrants (N=15,723) from the 2011-2012 academic year. These students were sent the eHQ, which consisted of 26 questions about health, health habits, social relations, and studying. Based on the eHQ responses, students were referred to one of the following interventions: (1) a health check, (2) an appointment other than a health check (eg, physiotherapy), or (3) electronic feedback to support a healthy lifestyle, when the other interventions were not necessary. Multiple comparisons will be made within these groups using logistic regression. The primary outcome variables are graduation, having a mental health problem, and attending a health check. The use of FSHS health care services will be studied with the cluster analysis method. The data have been obtained from three nationwide registers: the eHQ register, the medical records of FSHS, and the Higher education achievement register. The data have been linked using personal identity codes.
RESULTS: As of August 2019, the data collection and processing are complete and the statistical analyses are in progress. Preliminary results are expected in autumn 2019. Further publications are expected in 2020, and two PhD theses are expected to be completed by the end of 2022.
CONCLUSION: Studying practical procedures in primary health care is highly important for resource allocation and the development of evidence-based processes. This study will be the first to assess the usage of a health questionnaire in screening students for health checks. The findings of this study will contribute to the field of preventive health care. The main practical implication is the development of the FSHS's health examination process. We hypothesize that participation in the health examination process enhances academic achievement and the detection of university students' mental health problems early on in their studies.
View protocol

References relating to diabetes and cardiovascular disease risk screening or CVD prevention (74)

Guidance
Cosentino, F., Grant, P. J., Aboyans, V., et al. 2020. **2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD**. European Heart Journal 41(2) 255-323.   AIM: to provide guidance on the management and prevention of cardiovascular (CV) disease (CVD) in subjects with, and at risk of developing, diabetes mellitus (DM).   METHODS: The Members of the Task Force were selected by the ESC and EASD, including representation from relevant ESC sub-specialty groups, in order to represent professionals involved with the medical care of patients with this pathology. Selected experts in the field from both societies undertook a comprehensive review of the published evidence for management of a given condition according to ESC Committee for Practice Guidelines (CPG) policy. A critical evaluation of diagnostic and therapeutic procedures was performed, including assessment of the risk–benefit ratio.   RESULTS: The level of evidence and the strength of the recommendation of particular management options were weighed and graded according to predefined scales   CONCLUSION: The emphasis in these Guidelines is to provide information on the current state of the art in how to prevent and manage the effects of DM on the heart and vasculature   View full text   Piepoli, M. F., Abreu, A., Albus, C., et al. 2020. **Update on cardiovascular prevention in clinical practice: A position paper of the European Association of Preventive Cardiology of the European Society of Cardiology**. European Journal of Preventive Cardiology 27(2) 181-205.   AIM: to provide a summary and critical review of the most important new studies and evidence since the latest guidelines were published.   METHODS: the task force and experts from the European Association of Preventive Cardiology reviewed new information published since 2016. Greater emphasis has been put on a population-based approach and on disease-specific interventions, avoiding re-interpretation of information already and previously considered.   RESULTS: The presence of several gaps in the knowledge is highlighted.   CONCLUSION: Unfortunately, not all the gaps pointed out in the ESC CVD prevention guidelines are solved yet.   View full text   Public Health England 2020. **Cardiovascular disease prevention: applying All Our Health**.   AIM: to provide evidence and guidance to help healthcare professionals prevent heart attacks, strokes and dementia, and to improve cardiovascular health   METHODS AND RESULTS: online resource providing information and interactive e-learning   CONCLUSION: This resource helps front-line health professionals, team leaders or managers, senior or strategic leaders, to prevent ill health and promote wellbeing as part of their everyday practice. We also recommend important actions that managers and staff holding strategic roles can take.   View full text

Evidence summaries

Public Health England 2020. **The 10-year CVD ambitions for England – one year on.** Health Matters.

AIM: to outline several promising areas of work and initiatives led by members of the National CVD Prevention System Leadership Forum (CVDSLF) that have been addressing the ABC (Atrial fibrillation, Blood pressure, Cholesterol) ambitions

METHOD: an official PHE blog

RESULTS: We are now one year on from when the National CVDSLF – made up of 40 organisations and convened by PHE – agreed a set of national ambitions for the detection and management of the high-risk conditions over the next 10 years, known as 'the cardiovascular ABC's. This blog discusses these ambitions.

View full text

Tanner, M. 2020. **In screen-detected type 2 diabetes, intensive therapy did not differ from usual care for CV events at 10 years**. ACP Journal Club 172(8) JC41-JC41.

AIM: to summarise a paper on the ADDITION randomised trial

METHODS AND RESULTS: A summary of: Griffin SJ, Rutten GEHM, Khunti K, et al. *Long-term effects of intensive multifactorial therapy in individuals with screen-detected type 2 diabetes in primary care: 10-year follow-up of the ADDITION-Europe cluster-randomised trial.* Lancet Diabetes Endocrinol. 2019;7:925-37.

CONCLUSION: In screen-detected type 2 diabetes, intensive therapy did not differ from usual care for CV events at 10 years

View extract

Tort, S. & Ciapponi, A. 2020. **What are the effects of mobile phone–based interventions for primary prevention of cardiovascular disease (CVD)?** Cochrane Clinical Answers.

AIM: to summarise a Cochrane review on the effects of mobile phone–based interventions for primary prevention of cardiovascular disease

METHODS: Cochrane Clinical Answers (CCAs) provide a readable, digestible, clinically-focused entry point to rigorous research from Cochrane Reviews. They are designed to be actionable and to inform point-of-care decision-making. Each CCA contains a clinical question, a short answer, and data for the outcomes from the Cochrane Review deemed most relevant to practising healthcare professionals, our target audience.

RESULTS: Cochrane Clinical Answer: Some RCTs evaluating mobile phone–based interventions for primary prevention of CVD reported small benefits for low-density lipoprotein (LDL) cholesterol, total cholesterol, systolic blood pressure, and/or diastolic blood pressure, and little to no impact on high-density lipoprotein (HDL) cholesterol, quality of life, satisfaction with treatment, or adverse events.

CONCLUSION: Evidence is of low certainty, precluding firm conclusions

View full text

Systematic reviews

Alshehri, A. A., Jalal, Z., Cheema, E., et al. 2020. **Impact of the pharmacist-led intervention on the control of medical cardiovascular risk factors for the primary prevention of cardiovascular disease in general practice: A systematic review and meta-analysis of randomised controlled trials**. British Journal of Clinical Pharmacology 86(1) 29-38.

AIM: To conduct a systematic review and meta-analysis of the effectiveness of general practice-based pharmacist interventions in reducing the medical risk factors for the primary prevention of cardiovascular events.

METHODS: A systemic search was undertaken in 8 databases: PubMed, MEDLINE, EMBASE, PsycINFO, Cochrane Library, CINAHL Plus, SCOPUS and Science Citation Index, with no start date up to 27 March 2019. Randomised controlled trials assessing the effectiveness of pharmacist-led interventions delivered in the general practice in reducing the medical risk factors of cardiovascular

events were included in the review. The risk of bias in the studies was assessed using the Cochrane risk of bias tool.

RESULTS: A total of 1604 studies were identified, with 21 randomised controlled trials (8933 patients) meeting the inclusion criteria. Fourteen studies were conducted in patients with diabetes, 7 in hypertension, 2 involving dyslipidaemia, and 2 with hypertension and diabetes together. The most frequently used interventions were medication review and medication management. The quality of the included studies was variable. Patients receiving pharmacist-led interventions were associated with a statistically significant reduction in their systolic blood pressure (-9.33 mmHg [95% Confidence Interval (CI) -13.36 to -5.30]), haemoglobin A1C (-0.76% [95% CI -1.15 to -0.37]) and low-density lipoprotein-cholesterol (-15.19 mg/dL [95% CI -24.05 to -6.33]). Moreover, practice-based pharmacists' interventions were also reported to have a positive impact on patient adherence to medications.

CONCLUSION: The findings of this review suggest that pharmacist-led interventions in general practice can significantly reduce the medical risk factors of cardiovascular disease events. These findings support the involvement of pharmacists as healthcare providers in managing patients with hypertension, diabetes and dyslipidaemia.
View full text

Kivelä, J., Wikström, K., Virtanen, E., et al. 2020. **Obtaining evidence base for the development of Feel4Diabetes intervention to prevent type 2 diabetes – a narrative literature review**. BMC Endocrine Disorders 20 1-24.

AIM: to undertake a literature review in order to guide the development of evidence-based implementation of the Feel4Diabetes intervention.

METHODS: Scientific and grey literature published between January 2000 and January 2015 was searched for relevant studies using electronic databases. To present the literature review findings in a systematic way, we used the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework. A complementary literature search from February 2015 to December 2018 was also conducted.

RESULTS: The initial review included 27 studies with a follow-up ≥12 months and 9 studies with a follow-up ≥6 months and with a participant mean age < 45 years. We found out that interventions should be targeted at people at risk to improve recruiting and intervention effectiveness. Screening questionnaires (primarily Finnish Diabetes Risk Score FINDRISC) and blood glucose measurement can both be used for screening; the method does not appear to affect intervention effectiveness. Screening and recruitment is time-consuming, especially when targeting lower socioeconomic status and age under 45 years. The intervention intensity is more important for effectiveness than the mode of delivery. Moderate changes in several lifestyle habits lead to good intervention results. A minimum of 3-year follow-up seemed to be required to show a reduction in diabetes risk in high-risk individuals. In participants < 45 years, the achieved results in outcomes were less pronounced. The complementary review included 12 studies, with similar results regarding intervention targets and delivery modes, as well as clinical significance.

CONCLUSION: This narrative review highlighted several important aspects that subsequently guided the development of the Feel4Diabetes high-risk intervention. Research on diabetes prevention interventions targeted at younger adults or vulnerable population groups is still relatively scarce. Feel4Diabetes is a good example of a project aiming to fill this research gap.
View full text

O'Sullivan, J. W., Grigg, S., Crawford, W., et al. 2020. **Accuracy of Smartphone Camera Applications for Detecting Atrial Fibrillation: A Systematic Review and Meta-analysis**. JAMA Network Open 3(4) e202064-e202064

AIM: To determine the accuracy of smartphone camera applications that diagnose AF.

METHODS: MEDLINE and Embase were searched until January 2019 for studies that assessed the accuracy of any smartphone applications that use the smartphone's camera to measure the amplitude

and frequency of the user's fingertip pulse to diagnose AF. Data Extraction and Synthesis: Bivariate random-effects meta-analyses were constructed to synthesize data. The study followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) of Diagnostic Test Accuracy Studies reporting guideline. Main Outcomes and Measures: Sensitivity and specificity were measured with bivariate random-effects meta-analysis. To simulate the use of these applications as a screening tool, the positive predictive value (PPV) and negative predictive value (NPV) for different population groups (ie, age ≥65 years and age ≥65 years with hypertension) were modeled. Lastly, the association of methodological limitations with outcomes were analyzed with sensitivity analyses and metaregressions.

RESULTS: A total of 10 primary diagnostic accuracy studies, with 3852 participants and 4 applications, were included. The oldest studies were published in 2016 (2 studies [20.0%]), while most studies (4 [40.0%]) were published in 2018. The applications analyzed the pulsewave signal for a mean (range) of 2 (1-5) minutes. The meta-analyzed sensitivity and specificity for all applications combined were 94.2% (95% CI, 92.2%-95.7%) and 95.8% (95% CI, 92.4%-97.7%), respectively. The PPV for smartphone camera applications detecting AF in an asymptomatic population aged 65 years and older was between 19.3% (95% CI, 19.2%-19.4%) and 37.5% (95% CI, 37.4%-37.6%), and the NPV was between 99.8% (95% CI, 99.83%-99.84%) and 99.9% (95% CI, 99.94%-99.95%). The PPV and NPV increased for individuals aged 65 years and older with hypertension (PPV, 20.5% [95% CI, 20.4%-20.6%] to 39.2% [95% CI, 39.1%-39.3%]; NPV, 99.8% [95% CI, 99.8%-99.8%] to 99.9% [95% CI, 99.9%-99.9%]). There were methodological limitations in a number of studies that did not appear to be associated with diagnostic performance, but this could not be definitively excluded given the sparsity of the data.

CONCLUSION: In this study, all smartphone camera applications had relatively high sensitivity and specificity. The modeled NPV was high for all analyses, but the PPV was modest, suggesting that using these applications in an asymptomatic population may generate a higher number of false-positive than true-positive results. Future research should address the accuracy of these applications when scre ning other high-risk population groups, their ability to help monitor chronic AF, and, ultimately, their associations with patient-important outcomes.

View full text

Santos, P. 2020. **The Role of Cardiovascular Risk Assessment in Preventive Medicine: A Perspective from Portugal Primary Health-Care Cardiovascular Risk Assessment**. Journal of Environmental and Public Health 2020 1639634.

AIM: to review the utilization of risk estimators in primary health care, through a comprehensive review of the literature and official national and international health data (OECD and WHO).

METHODS: to review the main tools to assess the cardiovascular risk and the way the global risk may be used and interpreted in primary health care.

RESULTS: All the models are valid, although they present several differences about what they are actually estimating and the way the result can be integrated in clinical practice. Two problems are often pointed to these calculators: the underestimation of the risk in younger individuals and the difficulty in the management of residual risk. Ageing is the main factor affecting the risk of cardiovascular disease. So, it is natural that even in the presence of other factors, the younger present low risk, especially if we make the calculations for the next 10 years.

CONCLUSION: There are several algorithms to objectify the risk of cardiovascular diseases, given the diversity of factors at stake. None of them is sufficiently reliable to get a universal recommendation, especially if we continue to look at them from a divination point of view, as many times we see. Risk assessment allows us to weight the different factors, helping to categorize our patients from a cardiovascular perspective, aiming to prioritize the better decision towards a reduction of cardiovascular disease burden, both in the individual as well as in the whole population. This risk modelling is crucial for preventive management, aiming to avoid the cardiovascular event, but with the concern of not causing harm and respecting the autonomy of the patient.

View full text

Larrabee Sonderlund, A., Thilsing, T. & Sondergaard, J. 2019. **Should social disconnectedness be included in primary-care screening for cardiometabolic disease? A systematic review of the relationship between everyday stress, social connectedness, and allostatic load**. PLoS One 14(12) e0226717.

AIM: to review the empirical knowledge on the relationship between everyday stress, social connectedness, and allostatic load.

METHODS: Of 6022 articles retained in the literature search, 20 met predefined inclusion criteria.

RESULTS:These studies overwhelmingly support the notion that social connectedness correlates negatively with allostatic load. Several moderators of this relationship were also identified, including gender, social status, and quality of social ties.

CONCLUSION: More research into these factors, however, is warranted to conclusively determine their significance. The current evidence strongly indicates that the more socially connected individuals are, the less likely they are to experience chronic stress and associated allostatic load. The negative association between social connectedness and various chronic diseases can thus, at least partially, be explained by the buffering qualities of social connectedness against allostatic load. We argue that assessing social connectedness in clinical and epidemiological settings may therefore represent a considerable asset in terms of prevention and intervention.

View full text

Trials

Badenbroek, I. F., Nielen, M. M. J., Hollander, M., et al. 2020. **Mapping non-response in a prevention program for cardiometabolic diseases in primary care: how to improve participation?** Preventive Medicine Reports 101092.

AIM: to define factors that influence the primary response to a selective CMD prevention program and to determine response-enhancing strategies that influence the willingness to participate.

METHODS: We conducted a non-response analysis within a randomized controlled trial evaluating a selective CMD prevention program, the study was conducted from 2013 to 2018 in Netherlands. A random sample of 5,616 patients from 15 general practices were invited to complete a risk score (RS) as initial step of the program. Non-responders received an additional questionnaire. The response on the risk score was 51% (n=2,872).

RESULTS: From the 3,558 non-response questionnaires sent, 786 (22%) were returned. In a multivariable multilevel regression analysis smoking was independently associated with non-response. Of all reported reasons for non-response 'forgot/no time' accounted for 45%. In total, 73% of the non-responders indicated to reconsider participation when approached differently.

CONCLUSION: A personal approach by the patients' own GP, using advertisements and informative campaigns are potentially the best methods to enhance the response. Although a relatively high proportion did not respond to the invitation for the risk score, the majority of them indicated to be willing to participate if a different invitation strategy would be used. With more time and energy, response rates for CMD prevention programs could possibly increase substantially. A next logical step in this process is to test potential response enhancing strategies in research setting.

View full text

Charles, M., Bruun, N. H., Simmons, R., et al. 2020. **The effect of training GPs in motivational interviewing on incident cardiovascular disease and mortality in people with screen-detected diabetes. Results from the ADDITION-Denmark randomised trial.** BJGP Open 18

AIM: Within a trial of intensive treatment of people with screen-detected diabetes, which included training in motivational interviewing for GPs, the study examined the effect of the intervention on incident cardiovascular disease (CVD) and all-cause mortality.

METHODS: In the ADDITION-Denmark trial, 181 general practices were cluster randomised in a 2:1:1 ratio to: (i) to screening plus routine care of individuals with screen-detected diabetes (control group); (ii) screening plus training and support in intensive multifactorial treatment of individuals with screen-detected diabetes (intensive treatment group); or (iii) screening plus training and support in intensive

multifactorial treatment and motivational interviewing for individuals with screen-detected diabetes (intensive treatment plus motivational interviewing group). The study took place from 2001-2009. After around 8 years follow-up, rates of first fatal and non-fatal CVD events and all-cause mortality were compared between screen-detected individuals in the three treatment groups.

RESULTS: Compared with the routine care group, the risk of CVD was similar in the intensive treatment group (hazard ratio [HR] 1.11, 95% confidence interval [CI] = 0.82 to 1.50) and the intensive treatment plus motivational interviewing group (HR 1.26, 95% CI = 0.96 to 1.64). The incidence of death was similar in all three treatment groups.

CONCLUSION: Training of GPs in intensive multifactorial treatment, with or without motivational interviewing, was not associated with a reduction in mortality or CVD among those with screen-detected diabetes.

View full text

Kaasenbrood, F., Hollander, M., de Bruijn, S. H., et al. 2020. **Opportunistic screening versus usual care for diagnosing atrial fibrillation in general practice: a cluster randomised controlled trial**. British Journal of General Practice 27 27

AIM: To investigate the yield of opportunistic screening for AF in usual primary care using a single-lead ECG device.

METHODS: A clustered, randomised controlled trial among patients aged >=65 years with no recorded AF status in the Netherlands from October 2014 to March 2016. Fifteen intervention general practices used a single-lead ECG device at their discretion and 16 control practices offered usual care. The follow-up period was 1 year, and the primary outcome was the proportion of newly diagnosed cases of AF.

RESULTS: In total, 17 107 older people with no recorded AF status were eligible to participate in the study. In the intervention arm, 10.7% of eligible patients (n = 919) were screened over the duration of the study year. The rate of newly diagnosed AF was similar in the intervention and control practices (1.43% versus 1.37%, P = 0.73). Screened patients were more likely to have comorbidities, such as hypertension (60.0% versus 48.7%), type 2 diabetes (24.3% versus 18.6%), and chronic obstructive pulmonary disease (11.3% versus 7.4%), than eligible patients not screened in the intervention arm. Among patients with newly diagnosed AF in intervention practices, 27% were detected by screening, 23% by usual primary care, and 50% by a medical specialist or after stroke/transient ischaemic attack.

CONCLUSION: Opportunistic screening with a single-lead ECG at the discretion of the GP did not result in a higher yield of newly detected cases of AF in patients aged >=65 years in the community than usual care. For higher participation rates in future studies, more rigorous screening methods are needed.

View abstract

Persell, S. D., Peprah, Y. A., Lipiszko, D., et al. 2020. **Effect of Home Blood Pressure Monitoring via a Smartphone Hypertension Coaching Application or Tracking Application on Adults With Uncontrolled Hypertension: A Randomized Clinical Trial**. JAMA Network Open 3(3) e200255-e200255.

AIM: To investigate the effect of an artificial intelligence smartphone coaching app to promote home monitoring and hypertension-related behaviors on systolic blood pressure level compared with a blood pressure tracking app.

METHODS: This was a 2-group, open, randomized clinical trial. Participants with uncontrolled hypertension were recruited in 2016 and 2017 and were followed up for 6 months. Data analysis was performed from April 2019 to December 2019. Interventions: Intervention group participants received a smartphone coaching app to promote home monitoring and behavioral changes associated with hypertension self-management plus a home blood pressure monitor. Control participants received a blood pressure tracking app plus a home blood pressure monitor.

RESULTS: The primary study outcome was systolic blood pressure at 6 months. Secondary outcomes included self-reported antihypertensive medication adherence, home monitoring and self-

management practices, measures of self-efficacy associated with blood pressure, weight, and self-reported health behaviors. Results: There were 333 participants randomized, and 297 completed the follow-up assessment. Among the participants who completed the study, the mean (SD) age was 58.9 (12.8) years, 182 (61.3%) were women, and 103 (34.7%) were black. Baseline mean (SD) systolic blood pressure was 140.6 (12.2) mm Hg among intervention participants and 141.8 (13.4) mm Hg among control participants. After 6 months, the corresponding mean (SD) systolic blood pressures were 132.3 (15.0) mm Hg and 135.0 (13.9) mm Hg, with a between-group adjusted difference of −2.0 mm Hg (95% CI, −4.9 mm Hg to 0.8 mm Hg; P =.16). At 6 months, self-confidence in controlling blood pressure was greater in the intervention group (0.36 point on a 5-point scale; 95% CI, 0.18 point to 0.54 point; P <.001). There were no significant differences between the 2 groups in other secondary outcomes. The adjusted difference in self-reported physical activity was 26.7 minutes per week (95% CI, −5.4 minutes per week to 58.8 minutes per week; P =.10). Subgroup analysis raised the possibility that intervention effects differed by age.

CONCLUSION: Among individuals with uncontrolled hypertension, those randomized to a smartphone coaching app plus home monitor had similar systolic blood pressure compared with those who received a blood pressure tracking app plus home monitor. Given the direction of the difference in systolic blood pressure between groups and the possibility for differences in treatment effects across subgroups, future studies are warranted.

View full text

Griffin, S. J., Rutten, G., Khunti, K., et al. 2019. **Long-term effects of intensive multifactorial therapy in individuals with screen-detected type 2 diabetes in primary care: 10-year follow-up of the ADDITION-Europe cluster-randomised trial.** The Lancet Diabetes & Endocrinology 7(12) 925-937.

AIM: The multicentre, international ADDITION-Europe study investigated the effect of promoting intensive treatment of multiple risk factors among people with screen-detected type 2 diabetes over 5 years. Here we report the results of a post-hoc 10-year follow-up analysis of ADDITION-Europe to establish whether differences in treatment and cardiovascular risk factors have been maintained and to assess effects on cardiovascular outcomes.

METHODS: As previously described, general practices from four centres (Denmark, Cambridge [UK], Leicester [UK], and the Netherlands) were randomly assigned by computer-generated list to provide screening followed by routine care of diabetes, or screening followed by intensive multifactorial treatment. Population-based stepwise screening programmes among people aged 40-69 years (50-69 years in the Netherlands), between April, 2001, and December, 2006, identified patients with type 2 diabetes. Allocation was concealed from patients. Following the 5-year follow-up, no attempts were made to maintain differences in treatment between study groups. In this report, we did a post-hoc analysis of cardiovascular and renal outcomes over 10 years following randomisation, including a 5 years post-intervention follow-up. As in the original trial, the primary endpoint was a composite of first cardiovascular event, including cardiovascular mortality, cardiovascular morbidity (non-fatal myocardial infarction and non-fatal stroke), revascularisation, and non-traumatic amputation, up to Dec 31, 2014. Analyses were based on the intention-to-treat principle. ADDITION-Europe is registered with ClinicalTrials.gov, NCT00237549.

RESULTS: 343 general practices were randomly assigned to routine diabetes care (n=176) or intensive multifactorial treatment (n=167). 317 of these general practices (157 in the routine care group, 161 in the intensive treatment group) included eligible patients between April, 2001, and December, 2006. Of the 3233 individuals with screen-detected diabetes, 3057 agreed to participate (1379 in the routine care group, 1678 in the intensive treatment group), but at the 10-year follow-up 14 were lost to follow-up and 12 withdrew, leaving 3031 to enter 10-year follow-up analysis. Mean duration of follow-up was 9.61 years (SD 2.99). Sustained reductions over 10 years following diagnosis were apparent for bodyweight, HbA$_{1c}$, blood pressure, and cholesterol in both study groups, but between-group differences identified at 1 and 5 years were attenuated at the 10-year follow-up. By 10 years, 443 participants had a first cardiovascular event and 465 died. There was

no significant difference between groups in the incidence of the primary composite outcome (16.1 per 1000 person-years in the routine care group vs 14.3 per 1000 person-years in the intensive treatment group; hazard ratio [HR] 0.87, 95% CI 0.73-1.04; p=0.14) or all-cause mortality (15.6 vs 14.3 per 1000 person-years; HR 0.90, 0.76-1.07).

CONCLUSION: Sustained reductions in glycaemia and related cardiovascular risk factors over 10 years among people with screen-detected diabetes managed in primary care are achievable. The differences in prescribed treatment and cardiovascular risk factors in the 5 years following diagnosis were not maintained at 10 years, and the difference in cardiovascular events and mortality remained non-significant.

View abstract

Cohort studies

Bierig, S. M., Arnold, A., Einbinder, L. C., et al. 2020. **Unrecognized Cardiovascular Abnormalities Detected Through a Community Cardiovascular Screening Program**. Journal of Diagnostic Medical Sonography.

AIM: Self-referral community cardiovascular screening programs (CCSPs) have a potential to reduce outcome events through early detection of disease. This study evaluated the characteristics of a population that could predict a positive test.

METHODS: Participants who completed a cardiovascular screening protocol were compared. The screening protocol included a blood pressure (BP), Doppler ankle brachial index (ABI) testing, a limited carotid sonogram, a limited aortic sonogram, electrocardiogram (ECG), and limited transthoracic echocardiogram (TTE).

RESULTS: Screenings were performed on 205 participants (58% female, 68 +/- 9 years of age). Sixty-seven (34%) participants were abnormal in at least one of the following screening tests: ABI (2%), carotid sonogram (6%), aortic sonogram (3%), ECG (11%), and TTE (22%). Although 60.5% of the participants reported recent symptoms, there were no differences in normal or abnormal results of participants presenting with or without symptoms (P =.06). Income was not a predictor of abnormal test results (odds ratio, 0.76; 95% confidence interval, 0.55-0.97; P =.19). Multivariate analysis demonstrated, when controlling for age greater than 75 years, that participants taking BP medication was the only variable that predicted a positive test result.

CONCLUSION: One-third of patient results were abnormal, regardless of symptoms or lack thereof, suggestive of subclinical disease. Further large-scale studies would demonstrate the role of CCSPs in risk stratifying participants.

View full text

Duval, S., Van't Hof, J. R., Steffen, L. M., et al. 2020. **Estimation of cardiovascular risk from self-reported knowledge of risk factors: Insights from the minnesota heart survey**. Clinical Epidemiology 12 41-49.

AIM: to estimate CVD risk from individuals' knowledge of their own CVD risk factors and compare it to the risk calculated from measured risk factors.

METHODS: Using the ACC/AHA Pooled Cohort Risk Equations (PCE), we calculated 10-year CVD risk for 9856 primary prevention individuals aged 40-79 in the Minnesota Heart Survey (MHS). Using log-linear regression models, we estimated PCE risk from the individual's self-reported knowledge of four dichotomous risk factors: hypertension, hypercholesterolemia, diabetes, and smoking. Age was included in all models, and models were developed separately in women and men. Model performance was assessed internally using leave-one-out cross-validation.

RESULTS: The median measured PCE CVD risk in women was 2.1% (IQR: 0.8-5.6%), and in men was 6.3% (3.1-13.0%). Using the newly developed equations, the median estimated risk was 2.2% (0.9-5.8%) in women, and 6.9% (3.2-13.1%) in men. Using a threshold of 7.5% to categorize low and high risk, the novel risk calculation gave an accuracy of 95% for women and 87% for men compared to the measured PCE risk. The negative predictive value was 97% for women and 91% in men.

CONCLUSION: Self-reported knowledge of risk may be useful in the identification of individuals at low

risk for CV events, however, should always be followed up with measurement of risk factors if symptoms or history suggest CVD.

View full text

Hill, J., Peer, N., Jonathan, D., et al. 2020. **Findings from Community-Based Screenings for Type 2 Diabetes Mellitus in at Risk Communities in Cape Town, South Africa: A Pilot Study**. International Journal of Environmental Research & Public Health [Electronic Resource] 17(8) 21.
AIM: Completed and ongoing implementation activities globally advocate for community-based approaches to improve strategies for type 2 diabetes prevention. However, little is known about such strategies in the African region where there are higher relative increases in diabetes prevalence. We reported findings from the first 8-month pilot phase of the South African diabetes prevention program.
METHODS: The study was conducted across eight townships (four black and four mixed-ancestry communities) in Cape Town, South Africa, between August 2017 and March 2018. Participants were recruited using both random and self-selected sampling techniques because the former approach proved to be ineffective; <10% of randomly selected individuals consented to participate. Non-laboratory-based diabetes risk screening, using the African diabetes risk score, and based on targeted population specific cut-offs, identified potentially high-risk adults in the community. This was followed by an oral glucose tolerance test (OGTT) to confirm prevalent pre-diabetes.
RESULTS: Among the 853 adults without prior diabetes who were screened in the community, 354 (43.4%) were classified as high risk, and 316 presented for further screening. On OGTT, 13.1% had dysglycemia, including 10% with screen-detected diabetes and 67.9% with glycated haemoglobin (HbA1c)-defined high risk. Participants with pre-diabetes (n = 208) had high levels of common cardiovascular risk factors, i.e., obesity (73.7%), elevated total cholesterol (51.9%), and hypertension (29.4%).
CONCLUSION: Self-referral is likely an efficient method for selecting participants for community-based diabetes risk screening in Africa. Post-screening management of individuals with pre-diabetes must include attention to co-morbid cardiovascular risk factors.
View full text

Lip, G. Y. H., Skjoth, F., Nielsen, P. B., et al. 2020. **Evaluation of the C_2HEST Risk Score as a Possible Opportunistic Screening Tool for Incident Atrial Fibrillation in a Healthy Population (From a Nationwide Danish Cohort Study).** American Journal of Cardiology 125(1) 48-54.
AIM: A simple clinical score, C2HEST (C2: CAD/COPD [1 point each]; H: Hypertension; E: Elderly [Age ≥75, doubled]; S: Systolic HF [doubled]; T: Thyroid disease [hyperthyroidism]) has been proposed to predict incident atrial fibrillation (AF), with good discrimination and internal calibration. To define high-risk patients at particular age strata for incident AF in a nationwide population cohort, who could potentially be targeted for AF screening, we used a nationwide cohort study of all Danish citizen aged ≥65 years to evaluate the performance of the C2HEST score.
METHODS: "High risk" subjects at age 65, 70, and 75 had 5-year risks of new onset AF of 11.8%, 14.2% and 13.6%, respectively, and the corresponding event rates were 2.99, 3.67, and 3.38 per 100 person years, respectively. Associated hazard ratios (HR) were 4.08 (95% confidence interval [CI] 3.84 to 4.34), 3.80 (95% CI: 3.68 to 3.92) and 2.17 (95% CI: 2.13 to 2.22), respectively compared with the lowest risk strata within age category.
RESULTS: At all age cohorts, the greatest risk component of the C2HEST score on multivariable analysis was by having 2 points for C (C2), that is both CAD and COPD followed by systolic heart failure (S) both with HRs up to 2.0. CAD or COPD alone (C1) or hypertension (H) were associated with increased risk of new onset AF corresponding to HR between 1.44 and 1.64.
CONCLUSION: this nationwide population cohort addresses the question on clinical risk prediction for new onset AF in a population at different age strata, whereby the C2HEST score may help in identifying those at 'high risk' of new onset AF at 3 distinct age cohorts (65, 70, and 75 years). A high

risk C2HEST score stratum was associated with a greater risk of new onset AF. These patients could be considered for more intensive efforts for screening and detection of incident AF.
View full text

Lonnberg, L., Ekblom-Bak, E. & Damberg, M. 2020. **Reduced 10-year risk of developing cardiovascular disease after participating in a lifestyle programme in primary care**. Ups J Med Sci 1-7.
AIM: to evaluate change in cardiovascular risk factors and Framingham 10-year risk score of developing CVD in men and women at high cardiovascular risk after participation in a structured lifestyle programme over 1 year.
METHODS: A single-group study was carried out with a 1-year follow-up including before and after measurements. The lifestyle programme comprised five appointments to a district nurse over 1 year, focussing on lifestyle habits based on motivational interviewing. Fasting blood samples and anthropometric measurements were obtained at baseline and 1-year follow-up. The 10-year risk of CVD was calculated according to Framingham general CVD risk score.
RESULTS: A total of 404 patients were included in the study. There was a positive change over 1 year in the total study population for all risk factors evaluated. This included improvements in weight, waist circumference, blood pressure, blood lipids, and fasting glucose. The 10-year risk of developing CVD decreased for the total population from 24.8% to 21.4% at 1 year, equivalent to a 14% decrease.
CONCLUSION: A structured lifestyle programme in primary care contributes to significant improvements of cardiovascular risk factors and the reduction of 10-year risk for CVD for both men and women at high cardiovascular risk.
View full text

Obinwa, U., Perez, A., Lingvay, I., et al. 2020. **Multilevel Variation in Diabetes Screening Within an Integrated Health System.** Diabetes Care 43(5) 1016-1024.
AIM: Variation in diabetes screening in clinical practice is poorly described. We examined the interplay of patient, provider, and clinic factors explaining variation in diabetes screening within an integrated health care system in the U.S.
METHODS: We conducted a retrospective cohort study of primary care patients aged 18-64 years with two or more outpatient visits between 2010 and 2015 and no diagnosis of diabetes according to electronic health record (EHR) data. Hierarchical three-level models were used to evaluate multilevel variation in screening at the patient, provider, and clinic levels across 12 clinics. Diabetes screening was defined by a resulted gold standard screening test.
RESULTS: Of 56,818 patients, 70% completed diabetes screening with a nearly twofold variation across clinics (51-92%; P < 0.001). Of those meeting American Diabetes Association (ADA) (69%) and U.S. Preventive Services Task Force (USPSTF) (36%) screening criteria, three-quarters were screened with a nearly twofold variation across clinics (ADA 53-92%; USPSTF 49-93%). The yield of ADA and USPSTF screening was similar for diabetes (11% vs. 9%) and prediabetes (38% vs. 36%). Nearly 70% of patients not eligible for guideline-based screening were also tested. The USPSTF guideline missed more cases of diabetes (6% vs. 3%) and prediabetes (26% vs. 19%) than the ADA guideline. After adjustment for patient, provider, and clinic factors and accounting for clustering, twofold variation in screening by provider and clinic remained (median odds ratio 1.97; intraclass correlation 0.13).
CONCLUSION: Screening practices vary widely and are only partially explained by patient, provider, and clinic factors available in the EHR. Clinical decision support and system-level interventions are needed to optimize screening practices.
View abstract

Pickhardt, P. J., Graffy, P. M., Zea, R., et al. 2020. **Automated CT biomarkers for opportunistic prediction of future cardiovascular events and mortality in an asymptomatic screening population: a retrospective cohort study.** The Lancet Digital Health 2(4) e192-e200.

AIM: to compare the prognostic ability of automated CT-based body composition biomarkers derived from previously developed deep-learning and feature-based algorithms with that of clinical parameters (Framingham risk score [FRS] and body-mass index [BMI]) for predicting major cardiovascular events and overall survival in an adult screening cohort.

METHODS: In this retrospective cohort study, mature and fully automated CT-based algorithms with predefined metrics for quantifying aortic calcification, muscle density, ratio of visceral to subcutaneous fat, liver fat, and bone mineral density were applied to a generally healthy asymptomatic outpatient cohort of adults aged 18 years or older undergoing abdominal CT for routine colorectal cancer screening. To assess the association between the predictive measures (CT-based vs FRS and BMI) and downstream adverse events (death or myocardial infarction, cerebrovascular accident, or congestive heart failure subsequent to CT scanning), we used both an event-free survival analysis and logistic regression to compute receiver operating characteristic curves (ROCs).

RESULTS: 9223 people (mean age 57.1 years [SD 7.8]; 5152 [56%] women and 4071 [44%] men) who underwent CT scans between April, 2004, and December, 2016, were included in this analysis. In the longitudinal clinical follow-up (median 8.8 years [IQR 5.1-11.6]), subsequent major cardiovascular events or death occurred in 1831 (20%) patients. Significant differences were observed for all five automated CT-based body composition measures according to adverse events ($p<0.001$). Univariate 5-year area under the ROC (AUROC) values for predicting death were 0.743 (95% CI 0.705-0.780) for aortic calcification, 0.721 (0.683-0.759) for muscle density, 0.661 (0.625-0.697) for ratio of visceral to subcutaneous fat, 0.619 (0.582-0.656) for liver density, and 0.646 (0.603-0.688) for vertebral density, compared with 0.499 (0.454-0.544) for BMI and 0.688 (0.650-0.727) for FRS. Univariate hazard ratios for highest-risk quartile versus others for these same CT measures were 4.53 (95% CI 3.82-5.37) for aortic calcification, 3.58 (3.02-4.23) for muscle density, 2.28 (1.92-2.71) for the ratio of visceral to subcutaneous fat, 1.82 (1.52-2.17) for liver density, and 2.73 (2.31-3.23) for vertebral density, compared with 1.36 (1.13-1.64) for BMI and 2.82 (2.36-3.37) for FRS. Multivariate combinations of CT biomarkers further improved prediction over clinical parameters ($p<0.05$ for AUROCs). For example, the 2-year AUROC from combining aortic calcification, muscle density, and liver density for predicting death was 0.811 (95% CI 0.761-0.860).

CONCLUSION: Fully automated quantitative tissue biomarkers derived from CT scans can outperform established clinical parameters for presymptomatic risk stratification for future serious adverse events and add opportunistic value to CT scans performed for other indications.

View full text

Sharma, S. K., Koirala, B., Uprety, S., et al. 2020. **Screening and Control of Hypertension: Networking with Community in Resource Poor Setting.** Journal of the American College of Cardiology 75 (11) 2025.

AIM: to develop a strategy of screening and management of hypertension in communities.

METHODS: The Program for Detection and Management of Chronic Kidney Disease, Hypertension, Diabetes, and Cardiovascular Disease (KHDC) was initiated in 2006. A collaborating network among available health care providers in the community and tertiary care center created to educate, screen and intervene for kidney disease, hypertension, diabetes, and cardiovascular risk factors. A mechanism was developed to follow-up in primary or equivalent health center. The subjects were closely monitored by community volunteers to pursue follow-up and adherence to prescribed treatment. The achievement of blood pressure control and reduction of cardiovascular risk is reported here.

RESULTS: After initial health promotion activities population was screened for hypertension as well as life style factors, diabetes, CKD, lipid abnormalities. Twenty-eight thousand population (>=20 years)were screened. Hypertension, diabetes, hypercholesteremia and CKD was present in 22%, 8%, 17.3% and10.6% respectively. More than 10% participants had a 5-year risk of first cardiovascular event that exceeds 20%. The control of hypertension was poor (14%) at baseline. Screened positive were invited to enter an intervention program of lifestyle modifications and pharmacological management. 4624 subjects enter the intervention program. At the end of five years. Control of

hypertension (<130/80 mmHg) and hyperglycemia (HbA1c <7%) and was achieved in 65% and 60%, respectively and was better than the hospital-based program (NS). Predicted 10 years cardiovascular risk of 10% or more decreased from 28% to 16%.

CONCLUSION: In the low resource settings, engaging primary health care setup and activation of local human resources provides an opportunity for early identification and window of intervention for hypertension and CVD. This also helped people adhere to the low cost management program resulting in achieving significant control of blood pressure and reduction of cardiovascular risk

View abstract

Sudharsanan, N., Simiao, C., Garber, M., et al. 2020. **The Effect Of Home-Based Hypertension Screening On Blood Pressure Change Over Time In South Africa**. Health Affairs 39(1) 124-132.

AIM: to evaluate the impact of home-based hypertension screening on two-year change in blood pressure.

METHODS: Using multiple waves of the South African National Income Dynamics Study and the regression discontinuity design, we evaluated the impact of home-based hypertension screening on two-year change in blood pressure.

RESULTS: We found that the home-based screening intervention resulted in important reductions in systolic blood pressure for women and younger men. We did not find evidence of an effect on systolic blood pressure for older men or on diastolic blood pressure for either sex.

CONCLUSION: Our results suggest that home-based hypertension screening may be a promising strategy for reducing high blood pressure in low- and middle- income countries, but additional research and policy efforts are needed to ensure that such strategies have maximum reach and impact.

View abstract

Vos, R. C., den Ouden, H., Daamen, L. A., et al. 2020. **Population-based screen-detected type 2 diabetes mellitus is associated with less need for insulin therapy after 10 years**. BMJ Open Diabetes Research & Care 8(1).

AIM: to compare insulin prescription and glycemic control in people with screen-detected type 2 diabetes after 10 years with data from people diagnosed with type 2 diabetes seven (treatment legacy effect) and 10 years before during care-as-usual.

METHODS: Three cohorts were compared: one screen-detected cohort with 10 years diabetes duration (Anglo-Danish-Dutch study of Intensive Treatment in People with Screen-Detected Diabetes in Primary care (ADDITION-NL): n=391) and two care-as-usual cohorts, one with 7-year diabetes duration (Groningen Initiative to Analyze Type 2 Diabetes Treatment (GIANTT) and Zwolle Outpatient Diabetes project Integrating Available Care (ZODIAC): n=4473) and one with 10-year diabetes duration (GIANTT and ZODIAC: n=2660). Insulin prescription (primary outcome) and hemoglobin A1c (HbA1c) of people with a known diabetes duration of 7 years or 10 years at the index year 2014 were compared using regression analyses.

RESULTS: Insulin was prescribed in 10.5% (10-year screen detection), 14.7% (7-year care-as-usual) and 19.0% (10-year care-as-usual). People in the 7-year and 10-year care-as-usual groups had a 1.5 (95% CI 1.0 to 2.1) and 1.8 (95% CI 1.3 to 2.7) higher adjusted odds for getting insulin prescribed than those after screen detection. Lower HbA1c values were found 10 years after screen detection (mean 50.1 mmol/mol (6.7%) vs 51.8 mmol/mol (6.9%) and 52.8 mmol/mol (7.0%)), compared with 7 years and 10 years after care-as-usual (MD$_{adjusted}$: 1.6 mmol/mol (95% CI 0.6 to 2.6); 0.1% (95% CI 0.1 to 0.2) and 1.8 mmol/mol (95% CI 0.7 to 2.9); and 0.2% (95% CI 0.1 to 0.3)).

CONCLUSION: Population-based screen-detected type 2 diabetes is associated with less need for insulin after 10 years compared with people diagnosed during care-as-usual. Glycemic control was better after screen detection but on average good in all groups.

View full text

Aguilar Martin, C., Goncalves, A. Q., Lopez-Pablo, C., et al. 2019. **Ten-Year Follow-Up of Clinical Governance Implementation in Primary Care: Improving Screening, Diagnosis and Control of Cardiovascular Risk Factors.** Int J Environ Res Public Health 16(21).

AIM: to evaluate the impact of clinical governance on cardiovascular health after ten years of implementation in Catalonia.

METHODS: A cohort study that included 1878 patients was conducted in 19 primary care centres (PCCs). Audits that comprised 13 cardiovascular health indicators were performed and general practitioners received periodic (annual, biannual or monthly) feedback about their clinical practice. We evaluated improvement in screening, diagnosis and control of the main CRFs and the effects of the feedback on cardiovascular risk (CR), incidence of cardiovascular disease (CVD) and mortality, comparing baseline data with data at the end of the study (after a 10-year follow-up). The impact of the intervention was assessed globally and with respect to feedback frequency.

RESULTS AND CONCLUSION: General improvement was observed in screening, percentage of diagnoses and control of CRFs. At the end of the study, few clinically significant differences in CRFs were observed between groups. However, the reduction in CR was greater in the group receiving high frequency feedback, specifically in relation to smoking and control of diabetes and cholesterol (Low Density Lipoprotein (LDL) and High Density Lipoprotein (HDL)). A protective effect of having a cardiovascular event (hazard ratio (HR) = 0.64, 95% confidence interval (CI) = 0.44-0.94) or death (HR = 0.55, 95% CI = 0.35-0.88) was observed in patients from centres where general practitioners received high frequency feedback. Additionally, these PCCs presented improved cardiovascular health indicators and lower incidence and mortality by CVD, illustrating the impact of this intervention.
View full text

Aubrey-Bassler, K., Fernandes, C., Penney, C., et al. 2019. **The effectiveness of a proven chronic disease prevention and screening intervention in diverse and remote primary care settings: An implementation study on the BETTER 2 Program**. BJGP Open 3(3).

AIM: To evaluate outcomes from implementation of BETTER in diverse clinical settings.

METHODS: An implementation study was undertaken to apply the CDPS intervention from the BETTER trial to diverse settings in BETTER 2. Patients aged 40-65 years were invited to enrol in the study from three clinics in Newfoundland and Labrador, Canada. At baseline, eligibility for 27 CDPS actions (for example, cancer, diabetes and hypertension screening, lifestyle) was determined. Patients then met with a trained provider and prioritised goals to address their eligible CDPS actions. Providers received training in behaviour change theory and practice. Descriptive analysis of clinical outcomes and success factors were reported.

RESULTS: A total of 154 patients (119 female and 35 male) had a baseline visit; 106 had complete outcome assessments, and the remainder had partial outcome assessments. At baseline, patients were eligible for a mean of 12.3 CDPS actions and achieved a mean of 6.0 (49%, 95% confidence intervals [CI] = 24% to 74%) at 6-month follow-up, including reduced hypertension (86% of eligible patients, 95% CI = 67% to 96%), weight control (51% of eligible patients, 95% CI = 42% to 60%), and smoking cessation (36% of eligible patients, 95% CI = 17% to 59%). Male, highly educated, and lower income individuals achieved a higher proportion of CDPS manoeuvers than their counterparts.

CONCLUSION: Clinical outcomes from this implementation study were comparable with those of the prior BETTER RCT, providing support for the BETTER Program as an effective approach to CDPS in more diverse general practice settings.
View full text

Cross-sectional

Anderson, J. R., Hunter, T., Dinallo, J. M., et al. 2020. **Population screening for atrial fibrillation by student pharmacists at health fairs.** Journal of the American Pharmacists Association: JAPhA 31 31.

AIM: to evaluate AF screening and education at student pharmacist-driven health fairs.

METHODS: Screening for AF was performed by student members of the American Pharmacist Association Academy of Student Pharmacists with preceptor oversight. Participants were screened using the KardiaMobile device (AliveCor, Mountain View, CA), a Food and Drug Administration-cleared device that interprets a medical-grade electrocardiogram in 30 seconds. Student pharmacists also calculated a CHA2DS2-VASc score. Participant education was provided using an American Heart Association AF patient information sheet. Learning assessment was evaluated with 3 multiple choice questions.

RESULTS: Students screened a total of 697 participants over a 6-month period at 13 health fairs. Overall, 71% of the participants were women aged 56 +/- 15 years (mean +/- SD). Sixteen of the participants (2.3%) who were screened received results indicating possible AF. None of the participants with a possible positive finding had symptoms suggestive of AF. Of these 16 participants, 11 (69%) had a CHA2DS2-VASc score greater than or equal to 2 (2.7 +/- 0.7). Most participants answered each learning assessment question correctly. More than 95% of participants believed that screening for AF at health fairs was important or very important.

CONCLUSION: Student pharmacist-driven health fairs were shown to be feasible models to screen for AF and were effective in providing AF education to the public. Student pharmacists also cultivated a clinical skill that is transferable to their future practice setting, including the community pharmacy setting. Additional studies are needed to assess whether population-based real-time assessment and detection of AF can reduce the risk of stroke in individuals with previously undetected AF.

View full text

Atayoglu, A. T., Inanc, N., Basmisirli, E., et al. 2020. **Evaluation of the Finnish Diabetes Risk Score (FINDRISC) for diabetes screening in Kayseri, Turkey**. Primary care diabetes 03 03.

AIM: to investigate the risk for type 2 diabetes using the Finnish Diabetes Risk Score (FINDRISC) in Kayseri.

METHODS: In total, 1500 adults aged 18 years or older were interviewed using the FINDRISC as Diabetes Risk Questionnaire and fasting serum glucose levels. The findings of FINDRISC were grouped according to gender and a score of 15 and above was accepted as a high risk in terms of Type 2 diabetes.

RESULTS: 13.5% of the participants were in the high- risk group. There was a statistically significant relationship between total FINDRISC score and gender (p < 0.001). While 15.2% of the women were in the high -risk group, 12.4% of the men were in the high- risk group. The percentage of women in the low-risk group (35.9%) is less than the men with low- risk of diabetes (38.5%). As the BMI increased, the individuals were found to have a high risk evaluated with the use of FINDRISC. 14.3% of women with waist circumference >88 and 6.7% of men with waist circumference >102 were in the high- risk group. (p < 0.001)

CONCLUSION: Risk of diabetes was found to be higher with the FINDRISC score as the BMI and waist circumference increased. FINDRISC can be used in the primary care for this purpose; fast and easy to be applied.

View abstract

Atyabi, V. C. & Kreider, K. E. 2020. **Screening for Diabetes and Self-Care in Patients With Severe Mental Illness**. Journal for Nurse Practitioners 16(1) e5-e8.

AIM: to increase diabetes screening rates in 3271 patients with SMI in a patient-centered medical home in Southern California using an American Diabetes Association (2017) adapted algorithm.

In addition, patients with diabetes and SMI were instructed to select self-care behavior goals.

METHODS: At the Santa Barbara Neighborhood Clinics in Southern California, a patient-centered medical home, a screening algorithm was developed to increase screenings for diabetes in patients with SMI.

RESULTS: Demographic variables, including race, sex, and age, did not differ between preintervention and postintervention. The mean age was 43.92 (n ¼ 1612) preintervention and 43.25 (n ¼ 1658) postintervention. Most of the patients were women (68.8% preintervention, 69.3% postintervention), and white (66.6% preintervention, 66.0% postintervention). Before provider training (preintervention), 1091 patients with SMI (67.7%) were screened for diabetes. There was a slight decrease for screening at postintervention, 1082 (65.3%), although this was not statistically significant (z¼_1.45, P ¼.147). Similarly, there was no significant difference in the percentage of patients with uncontrolled diabetes (A1c > 9%) between preintervention (35 [3.2%]) and postintervention (40 [3.7%]; z ¼ .638, P ¼ .522). Of all of the patients with SMI with newly or previously diagnosed diabetes (n ¼ 344), 6 patients had chosen and recorded self-care goals in the EMR after implementation. Patients could choose from any of the 7 AADE7 goals, including risk reduction, healthy eating, monitoring, being active, healthy coping, and taking medications. All seven possible AADE7 goals were chosen except for problem solving. The most commonly chosen goals were healthy coping and being active. Patients who chose to participate in self-care goal setting all had A1c values of < 7.0%.

CONCLUSIONS: Diabetes screening algorithms may not improve diabetes screening in patients with SMI. Patients with SMI with poor glycemic control avoid setting self-care goals.

View full text

Brown, E. C., Buchan, D. S., Madi, S. A., et al. 2020. **Grip Strength Cut Points for Diabetes Risk Among Apparently Healthy U.S. Adults.** American Journal of Preventive Medicine 01 01.

AIM: to establish muscular strength cut points for determining diabetes risk using a large, nationally representative U.S. sample

METHODS: Using the 2011-2012 and 2013-2014 National Health and Nutrition Examination Survey data, 5,108 participants aged 20-80 years (68.6% aged 20-50 years; young male participants, n=1,813, mean age=33.43 years; young female participants, n=1,692, mean age=33.39 years; older male participants, n=813, mean age=59.92 years; older female participants, n=790, mean age=60.45 years) and free of common diabetes comorbidities were included. Muscular strength was assessed using a handgrip dynamometer and normalized by adjusting for body weight. A logistic regression for survey data controlling for covariates was used to determine normalized grip strength cut points. Diabetes risk was determined using American Diabetes Association diagnostic criteria. Analyses were conducted in the summer of 2019.

RESULTS: Normalized grip strength significantly predicted diabetes (p=0.0332), and the cut points for detecting diabetes risk included 0.78 (young male participants), 0.57 (young female participants), 0.68 (older male participants), and 0.49 (older female participants). The risk percentages for diabetes and estimated rates reported for all subgroups were comparable, and the risk percentages included 6.84 (95% CI=5.32, 8.36; younger male participants), 7.49 (95% CI=5.87, 9.10; younger female participants), 5.76 (95% CI=2.34, 9.19, older male participants), and 4.27 (95% CI=2.44, 6.10; older female participants).

CONCLUSION: Normalized grip strength using the cut points proposed in this paper may be a useful screening tool for diabetes risk in apparently healthy, normotensive adults.

View full text

Cha, S. A., Chon, S., Yun, J. S., et al. 2020. **Optimal Fasting Plasma Glucose Levels and Hemoglobin A1c Levels for Screening of Prediabetes and Diabetes According to 2-Hour Plasma Glucose Criterion in a High-Risk Population: The Korean Diabetes Prevention Study**. Diabetes/Metabolism Research Reviews 15 15.

AIM: to assess the utility of fasting plasma glucose (FPG) and HbA1c to identify diabetes by the 2-hour plasma glucose (PG) criterion in the Korean population at high risk for diabetes.

METHODS: A total of 1646 participants with a BMI of >=23 kg/m^2 without having a history of diabetes were recruited in this study. The cutoff values of FPG and HbA1c for detecting diabetes were identified using the Youden index using receiver operating characteristic (ROC) analysis. The gold standard for diabetes prediction was defined by the 2-hour PG level of >=200 mg/dL.

RESULTS: The participants comprised 54.0% women, and the mean age of all participants was 55.0 +/- 8.1 years. At baseline, FPG was 104.1 +/- 14.2 mg/dL, the 2-hour PG value was 162.9 +/- 55.3 mg/dL, and HbA1c was 5.9% +/- 0.5%. 446 subjects (27.1%) were diagnosed with diabetes and 976 subjects (59.3%) were determined to be at prediabetes. The area under the ROC curve (AUC) of FPG and HbA1c for diabetes were 0.776 and 0.802, while the AUC of FPG and HbA1c for prediabetes were 0.515 and 0.477. The optimal cutoff value for diagnosing diabetes of FPG and HbA1c were 104.5 mg/dL (sensitivity 75.8%, specificity 67.5%) and 5.9% (sensitivity 80.6%, specificity 63.8%), respectively.

CONCLUSION: FPG of 104.5 mg/dL and HbA1c value of 5.9% (41 mmol/mol) can be used as an optimal screening value for diabetes by 2-hour PG criterion in the Korean population at high risk for diabetes.
View abstract

Chapman, N., Fonseca, R., Murfett, L., et al. 2020. **Integration of absolute cardiovascular disease risk assessment into routine blood cholesterol testing at pathology services**. Fam Pract.
AIM: to assess the feasibility of cholesterol requests at pathology services to improve uptake by integrating absolute CVD risk assessment with this service.
METHODS: Two-hundred and ninety-nine patients (45-74 years) referred to pathology services for blood cholesterol had measurement of all variables required to determine absolute CVD risk according to Framingham calculator (blood pressure, age, sex, smoking and diabetes status via self-report). Data were recorded via computer-based application. The absolute risk score was communicated via the report sent to the referring medical practitioner as per usual practice. Evaluation questionnaires were completed immediately post visit and at 1-, 3- and 6-month follow-up via telephone (n = 262).
RESULTS: Absolute CVD risk reports were issued for 90% of patients. Most patients (95%) reported that the length of time for the pathology service assessment was acceptable, and 91% that the self-directed computer-based application was easy to use. Seventy-eight per cent reported a preference for pathology services to conduct absolute CVD risk assessment. Only 2% preferred a medical practitioner. Of follow-up patients, 202 (75%) had a consultation with a medical practitioner, during which, aspects of CVD risk prevention were discussed (cholesterol and blood pressure 74% and 69% of the time, respectively).
CONCLUSION: Measurement of absolute CVD risk in pathology services is feasible, highly acceptable among middle-to-older adults and may increase uptake of guideline-directed care in general practice.
View abstract

Chen, X., Xu, S. K., Guo, Q. H., et al. 2020. **Barriers to blood pressure control in China in a large opportunistic screening.** Journal of Clinical Hypertension 09 09.
AIM: To investigate the prevalence, awareness, treatment, and control of hypertension in a large opportunistic screening study in China.
METHODS: Our study participants had to be >=18 years of age and had ideally not taken blood pressure (BP) for >=1 year. BP was measured three times consecutively in the sitting position with a 1-minute interval, using a validated electronic BP monitor or mercury sphygmomanometer. Trained volunteer investigators administered a questionnaire to collect information on medical history, lifestyle, and use of medications.
RESULTS: The 364 000 participants (52.6% women, and mean age 53.4 years) had a mean systolic/diastolic BP of 124.2/76.4 mm Hg. The proportion of hypertension was 24.7%. In all

hypertensive subjects (n = 89 925), the awareness, treatment, and control rates of hypertension were 60.1%, 42.5%, and 25.4%, respectively. In multiple stepwise logistic regression analyses, the odds for unawareness vs awareness of hypertension was higher in men and lower with age advancing, current smoking, and the presence of diabetes mellitus, coronary heart disease, and stroke or transient ischemic attack (P < .0001). The odds for uncontrolled vs controlled hypertension was higher with age advancing and current smoking, and lower with the presence of diabetes mellitus and coronary heart disease (P <= .03) in 38 207 treated hypertensive patients, and it was also higher with the use of antihypertensive monotherapy (odds ratio 1.13, P = .0003) in 19 523 treated hypertensive patients with specific antihypertensive drugs.

CONCLUSION: Our study identified several factors as barriers to BP control in China, such as male gender, younger age, current smoking, and the under-use of combination therapy.

View full text

Colombo, A., Voglino, G., Sessa, A., et al. 2020. **Prevention of chronic diseases in middle-age women: a cross-sectional study on an Italian large sample**. European Journal of Public Health 30(1) 70-75.

AIM: to assess frequencies of cardiovascular risk factors and analyzing participation in screening and vaccination.

METHODS: In 2017, a cross-sectional study was performed in Northern Italy. Totally, 12 249 women, aged between 50 and 54 years, were enrolled by General Practitioners (GPs). It was used a 21-item form, with information about: socio-demographic, anamnestic and clinical data, execution of a booster shot of tetanus-diphtheria-acellular pertussis (Tdap) vaccine in the last decade and of PAP-test, mammography and faecal occult blood test in the last 2 years. Descriptive and crosstab χ2 analyses were performed with STATA MP13. The significance level was P ≤ 0.05.

RESULTS: Our findings showed the presence of cardiovascular risk factors, such as obesity (10.95%), hypertension (13.76%), hyperlipidaemia (11.57%), glycaemia ≥ 100 mg dl−1 (16.97%), poor physical activity (73.49%), smoking (18.28%), cardiovascular family history (FH) (51.70%). There were a lower participation in colo-rectal cancer screening (45.09%) compared with breast (85.06%) and cervical (77.16%) cancer screening and an insufficient Tdap booster dose compliance (17.56%). Chi-square analyses showed correlations between cardiovascular FH and body mass index, hypertension, hyperlipidaemia, glycaemia and smoking, and between cancer FH and participation in breast and colo-rectal cancer screening (P < 0.05).

CONCLUSIONS: Women with cardiovascular disease FH represent a priority target of educational interventions considering the prevalence of concomitant risk factors. Programmes aimed at increasing screening and vaccination participation should be implemented.

View abstract

Fairman, K. A., Romanet, D., Early, N. K., et al. 2020. **Estimated Cardiovascular Risk and Guideline-Concordant Primary Prevention With Statins: Retrospective Cross-Sectional Analyses of US Ambulatory Visits Using Competing Algorithms.** Journal of Cardiovascular Pharmacology and Therapeutics 25(1) 27-36.

AIM: to consider alternatives to the original PCE (O-PCE) to assess potential statin benefit for primary prevention to reduce racial disparity.

METHODS: We performed retrospective, cross-sectional analysis of a nationally representative, US sample of office visits made from 2011 to 2014. Sampling criteria matched those used for PCE development: aged 40 to 79 years, black or white race, no cardiovascular disease. Original PCE, R-PCE, and USPSTF algorithms were applied to biometric and demographic data. Outcomes included estimated 10-year CVE risk, percentage exceeding each algorithm's statin-treatment threshold (>7.5% risk for O-PCE and R-PCE, and >10% O-PCE plus >1 risk factor for USPSTF), and percentage prescribed statin therapy.

RESULTS: In 12 556 visits (representing 285 330 123 nationwide), 10.8% of patients were black, 27.1% had diabetes, and 15.7% were current smokers. Replacing O-PCE with R-PCE decreased

mean (95% confidence interval [CI]) estimated CVE risk from 12.4% (12.0%-12.7%) to 8.5% (8.2%-8.8%). Significant (P < 0.05) racial disparity in the rate of CVE risk >7.5% was identified using O-PCE (black and white patients [95% CI], respectively: 58.8% [54.6%-62.9%] vs 52.8% [51.1%-54.4%], P =.006) but not R-PCE (41.6% [37.6%-45.7%] vs 39.9% [38.3%-41.5%], P =.448). Revised PCE and USPSTF recommendations were concordant for 90% of patients. Significant racial disparity in guideline-concordant statin prescribing was found using O-PCE (black and white patients, respectively, 35.0% [30.5%-39.9%] vs 41.8% [39.9%-44.4%], P =.013), but not R-PCE (40.6% [35.0%-46.6%] vs 43.0% [40.0%-45.9%], P =.482) or USPSTF recommendations (39.0% [33.8%-44.5%] vs 44.4% [41.5%-47.5%], P =.073).

CONCLUSION: Use of an alternative to O-PCE may reduce racial disparity in estimated CVE risk and may facilitate shared decision-making about primary prevention.
View full text

Gnavi, R., Sciannameo, V., Baratta, F., et al. 2020. **Opportunistic screening for type 2 diabetes in community pharmacies. Results from a region-wide experience in Italy**. PLoS ONE [Electronic Resource] 15(3) e0229842.

AIM: to report the results of an opportunistic screening for diabetes, implemented in the setting of community pharmacies.

METHODS AND RESULTS: To identify people at high risk to develop diabetes, pharmacists were trained to administer FINDRISC questionnaire to overweight, diabetes-free customers aged 45 or more. Each interviewee was followed for 365 days, searching in the administrative database whether he/she had a glycaemic or HbA1c test, or a diabetologists consultation, and to detect any new diagnosis of diabetes defined by either a prescription of any anti-hyperglycaemic drug, or the enrolment in the register of patients, or a hospital discharge with a diagnosis of diabetes. Out of 5977 interviewees, 53% were at risk of developing diabetes. An elevated FINDRISC score was associated with higher age, lower education, and living alone. Excluding the number of cases expected, based on the incidence rate of diabetes in the population, 51 new cases were identified, one every 117 interviews. FINDRISC score, being a male and living alone were significantly associated with the diagnosis.

CONCLUSION: The implementation of a community pharmacy-based screening programme can contribute to reduce the burden of the disease, particularly focusing on people at higher risk, such as the elderly and the socially vulnerable.
View full text

Gonzalez, A., Deng, Y., Lane, A. N., et al. 2020. **Impact of mismatches in HbA1c vs glucose values on the diagnostic classification of diabetes and prediabetes...2018 ADA Scientific Sessions in Orlando, Florida, USA.** Diabetic Medicine 37(4) 689-696.

AIM: To determine whether HbA1c mismatches (HbA1c levels that are higher or lower than expected for the average glucose levels in different individuals) could lead to errors if diagnostic classification is based only on HbA1c levels.

METHODS: In a cross-sectional study, 3106 participants without known diabetes underwent a 75-g oral glucose tolerance test (fasting glucose and 2-h glucose) and a 50-g glucose challenge test (1-h glucose) on separate days. They were classified by oral glucose tolerance test results as having: normal glucose metabolism; prediabetes; or diabetes. Predicted HbA1c was determined from the linear regression modelling the relationship between observed HbA1c and average glucose (mean of fasting glucose and 2-h glucose from the oral glucose tolerance test, and 1-h glucose from the glucose challenge test) within oral glucose tolerance test groups. The haemoglobin glycation index was calculated as [observed – predicted HbA1c], and divided into low, intermediate and high haemoglobin glycation index mismatch tertiles.

RESULTS: Those participants with higher mismatches were more likely to be black, to be men, to be older, and to have higher BMI (all P<0.001). Using oral glucose tolerance test criteria, the distribution of normal glucose metabolism, prediabetes and diabetes was similar across mismatch tertiles;

however, using HbA1c criteria, the participants with low mismatches were classified as 97% normal glucose metabolism, 3% prediabetes and 0% diabetes, i.e. mostly normal, while those with high mismatches were classified as 13% normal glucose metabolism, 77% prediabetes and 10% diabetes, i.e. mostly abnormal ($P<0.001$).

CONCLUSIONS: Measuring only HbA1c could lead to under-diagnosis in people with low mismatches and over-diagnosis in those with high mismatches. Additional oral glucose tolerance tests and/or fasting glucose testing to complement HbA1c in diagnostic classification should be performed in most individuals. What's new?: HbA1c mismatches, that is, HbA1c levels that are higher or lower than expected for average glucose levels, can limit the accuracy of HbA1c measurements in diabetes diagnosis and management, but their potential impact is not widely appreciated.In a diabetes screening cohort using the 75-g oral glucose tolerance test (OGTT) as the 'gold standard', use of the HbA1c test alone led to under-diagnosis in participants with low HbA1c mismatches and over-diagnosis with high HbA1c mismatches.Because HbA1c mismatches could lead to errors, diagnoses of diabetes/prediabetes should include measurement of glucose levels (fasting, OGTT) in addition to HbA1c in most individuals.

View full text

Jian, C., Zhao, A., Ma, X., et al. 2020. **Diabetes Screening: Detection and Application of Saliva 1,5-Anhydroglucitol by Liquid Chromatography-Mass Spectrometry**. Journal of Clinical Endocrinology & Metabolism 105(6) 01.

AIM: to evaluate the effectiveness of saliva 1,5-AG in diabetes screening in a Chinese population.
METHODS: This was a population-based cross-sectional study. A total of 641 subjects without a valid diabetic history were recruited from September 2018 to June 2019. Saliva 1,5-AG was measured with liquid chromatography-mass spectrometry. DM was defined per American Diabetes Association criteria. The efficiency of saliva 1,5-AG for diabetes screening was analyzed by receiver operating characteristic curves, and the optimal cutoff point was determined according to the Youden index.
RESULTS: Saliva 1,5-AG levels in subjects with DM were lower than those in subjects who did not have DM (both $P < .05$). Saliva 1,5-AG was positively correlated with serum 1,5-AG and negatively correlated with blood glucose and glycated hemoglobin (HbA1c) (all $P < .05$). The optimal cutoff points of saliva 1,5-AG0 and 1,5-AG120 for diabetes screening were 0.436 mug/mL (sensitivity: 63.58%, specificity: 60.61%) and 0.438 mug/mL (sensitivity: 62.25%, specificity: 60.41%), respectively. Fasting plasma glucose (FPG) combined with fasting saliva 1,5-AG reduced the proportion of people who required an oral glucose tolerance test by 47.22% compared with FPG alone.
CONCLUSION: Saliva 1,5-AG combined with FPG or HbA1c improved the efficiency of diabetes screening. Saliva 1,5-AG is robust in nonfasting measurements and a noninvasive and convenient tool for diabetes screening.

View abstract

Kotseva, K., De Backer, G., De Bacquer, D., et al. 2020. **Primary prevention efforts are poorly developed in people at high cardiovascular risk: A report from the European Society of Cardiology EURObservational Research Programme EUROASPIRE V survey in 16 European countries**. European Journal of Preventive Cardiology 2047487320908698.

AIM: to determine whether the 2016 Joint European Societies' guidelines on cardiovascular disease prevention in people at high cardiovascular risk have been implemented in clinical practice.
METHODS: The method used was a cross-sectional survey in 78 centres from 16 European countries. Patients without a history of atherosclerotic cardiovascular disease either started on blood pressure and/or lipid and/or glucose lowering treatments were identified and interviewed >= 6 months after the start of medication.
RESULTS: A total of 3562 medical records were reviewed and 2759 patients (57.6% women; mean age 59.0 +/- 11.6 years) interviewed (interview rate 70.0%). The risk factor control was poor with 18.1% of patients being smokers, 43.5% obese (body mass index $>=30$ kg/m^2) and

63.8% centrally obese (waist circumference >=88 cm for women, >=102 cm for men). Of patients on blood pressure lowering medication 47.0% reached the target of <140/90 mm Hg (<140/85 mm Hg in people with diabetes). Among treated dyslipidaemic patients only 46.9% attained low density lipoprotein-cholesterol target of <2.6 mmol/l. Among people treated for type 2 diabetes mellitus, 65.2% achieved the HbA1c target of <7.0%.

CONCLUSION: The primary care arm of the EUROASPIRE V survey revealed that large proportions of people at high cardiovascular disease risk have unhealthy lifestyles and inadequate control of blood pressure, lipids and diabetes. Thus, the potential to reduce the risk of future cardiovascular disease throughout Europe by improved preventive cardiology programmes is substantial.

View full text

Lee, S. R., Choi, E. K., Han, K. D., et al. 2020. **Effect of the variability of blood pressure, glucose level, total cholesterol level, and body mass index on the risk of atrial fibrillation in a healthy population**. Heart Rhythm 17(1) 12-19.

AIM: to evaluate the effect of the variability of 4 metabolic components including systolic blood pressure (BP), glucose level, total cholesterol (TC) level, and body mass index (BMI) on the risk of AF in the healthy population without hypertension, diabetes, or dyslipidemia.

METHODS: We identified 6,819,829 adult subjects without hypertension, diabetes, or dyslipidemia who had >=3 health checkups provided by the Korean National Health Insurance Corporation between 2005 and 2012. Glucose level, BP, TC level, and BMI were measured at each visit. Variability was defined as variability independent of the mean (VIM), and VIM of each parameter was divided into 4 groups. High variability was defined as having values in the highest quartile of each parameter.

RESULTS: During a mean follow-up of 5.3 +/- 1.1 years, 31,302 subjects were newly diagnosed with AF (0.86 per 1000 person-years). Subjects with the highest VIM quartile of BP, TC level, and BMI showed an increased risk of AF compared with those with the lowest VIM quartile, whereas glucose level variability had a marginal association. The composite of the high variability of metabolic parameters showed a graded risk of AF. After multivariable adjustment, subjects having 1, 2, 3, and 4 parameters of the highest VIM had an ~7%, 13%, 20%, and 35% increased risk of AF compared with those without any highest variability of metabolic parameters.

CONCLUSION: The variability of metabolic parameters showed a close association with the risk of AF in those without cardiovascular comorbidities.

View abstract

Lim, H. M., Chia, Y. C. & Koay, Z. L. 2020. **Performance of the Finnish Diabetes Risk Score (FINDRISC) and Modified Asian FINDRISC (ModAsian FINDRISC) for screening of undiagnosed type 2 diabetes mellitus and dysglycaemia in primary care**. Primary care diabetes 07 07.

AIM: To evaluate the performance of FINDRISC and ModAsian FINDRISC for the screening of undiagnosed diabetes and dysglycaemia in primary care. To compare the performance of FINDRISC with the recommendations of the American Diabetes Association (ADA) and US Preventive Services Task Force (USPSTF) guidelines.

METHODS: This cross-sectional study was carried out on 293 patients without a prior history of diabetes at a primary care clinic in Malaysia. Questions on body mass index and waist circumference were modified based on the Asian standard in ModAsian FINDRISC. Haemoglobin A1c of >=6.5% (48 mmol/mol) was used to diagnose diabetes. Areas under the receiver operating curve (ROC-AUC) for FINDRISC and ModAsian FINDRISC were analyzed.

RESULTS: The prevalence of undiagnosed diabetes was 7.5% and prediabetes was 32.8%. The ROC-AUC of FINDRISC was 0.76 (undiagnosed diabetes) and 0.79 (dysglycaemia). There was no statistical difference between FINDRISC and ModAsian FINDRISC. The recommended optimal FINDRISC cut-off point for undiagnosed diabetes was >=11 (Sensitivity 86.4%, Specificity 48.7%). FINDRISC >=11 point has higher sensitivity compared to USPSTF criteria (72.7%) and higher specificity compared to the ADA (9.6%).

CONCLUSION: FINDRISC is a useful diabetes screening tool to identify those at risk of diabetes in primary care in Malaysia.
View abstract

Madela, S., James, S., Sewpaul, R., et al. 2020. **Early detection, care and control of hypertension and diabetes in South Africa: A community-based approach**. African Journal of Primary Health Care & Family Medicine 12(1) e1-e9.
AIM: to investigate a community-based demonstration project using community caregivers (CCGs) trained in screening for hypertension and diabetes aimed at improving early detection and linkage to care and management.
METHODS: The CCGs were trained in NCD-related health education, promotion and screening for hypertension and diabetes using an accredited programme. The CCGs screened community members for hypertension and diabetes using three screening methods: door-to-door visits, community campaigns and workplaces.
RESULTS: Twenty-five CCGs received the accredited NCD training. A total of 10 832 community members were screened for hypertension and 6481 had their blood glucose measured. Of those screened, 29.7% and 4.4%, respectively, had raised blood pressure (>= 140/90 mmHg) and blood glucose (>= 11.0 mmol/L) who required referral to a primary healthcare facility. More than one in five (21.0%, n = 1448), of those with no previous hypertension diagnosis, were found to have raised blood pressure at screening, representing newly detected cases. Less than a third (28.5%) of patients referred to the facilities for raised blood pressure actually presented themselves for a facility assessment, of which 71.8% had their hypertension diagnosis confirmed and were advised to continue, adjust or initiate treatment. Similarly, 29.1% of patients referred to the facilities for raised blood glucose presented themselves at the facility, of which 71.4% received a confirmatory diabetes diagnosis.
CONCLUSION: Community caregivers played an important role in early detection of raised blood pressure and raised blood glucose, and in referring patients to primary care.
View full text

Manios, Y., Mavrogianni, C., Lambrinou, C. P., et al. 2020. **Two-stage, school and community-based population screening successfully identifies individuals and families at high-risk for type 2 diabetes: the Feel4Diabetes-study**. BMC Endocrine Disorders 20(Suppl 1) 12.
AIM: to describe the screening procedure applied in the Feel4Diabetes-study and examine its effectiveness in identifying individuals and families at high risk, primarily for T2D and secondarily for hypertension, among vulnerable populations in low to middle-income countries (LMICs) and high-income countries (HICs) across Europe.
METHODS: A two-stage screening procedure, using primary schools as the entry-point to the community, was applied in low socioeconomic status (SES) regions in LMICs (Bulgaria-Hungary), HICs (Belgium-Finland) and HICs under austerity measures (Greece-Spain). During the first-stage screening via the school-setting, a total of 20,501 parents (mothers and/or fathers) of schoolchildren from 11,396 families completed the Finnish Diabetes Risk Score (FINDRISC) questionnaire, while their children underwent anthropometric measurements in the school setting. Parents from the identified "high-risk families" (n = 4484) were invited to participate in the second-stage screening, including the measurement of fasting plasma glucose (FPG) and blood pressure (BP). In total, 3153 parents participated in the second-stage screening (mean age 41.1 +/- 5.6 years, 65.8% females).
RESULTS: Among parents who attended the second-stage screening, the prevalence of prediabetes (as defined by impaired fasting glucose; FPG 100-125 mg/dl) and T2D (FPG > 126 mg/dl) was 23.2 and 3.0% respectively, and it was found to be higher in the higher FINDRISC categories. The percentage of undiagnosed T2D among the participants identified with T2D was 53.5%. The prevalence of high normal BP (systolic BP 130-139 mmHg and/ or diastolic BP 85-89 mmHg) and hypertension (systolic BP >= 140 mmHg and/ or diastolic BP >= 90 mmHg) was 14 and 18.6%

respectively, which was also higher in the higher FINDRISC categories. The percentage of cases not receiving antihypertensive treatment among the participants identified with hypertension was 80.3%. CONCLUSION: The findings of the current study indicate that the two-stage school and community-based screening procedure followed, effectively identified high-risk individuals and families in vulnerable populations across Europe. This approach could be potentially scalable and sustainable and support initiatives for the early prevention of T2D and hypertension.
View full text

Reynolds, M. M. & Childers, T. B. 2020. **Preventive Health Screening Disparities Among Immigrants: Exploring Barriers to Care**. Journal of Immigrant & Minority Health 22(2) 336-344.
AIM: to investigate the explanatory strength of socioeconomic, health services, and immigration-related factors in explaining disparities in health screening rates for cardiovascular risk screening across eight immigrant groups.
METHODS: Using nationally representative data from the National Health Interview Survey, we test the hypothesis that known correlates of preventive healthcare seeking differ in their ability to predict screening behavior depending on region of origin.
RESULTS AND CONCLUSION: health service factors (lack of insurance and no place for care) are fairly consistent predictors of preventive screening while socioeconomic and immigration-related factors are less so. These findings surface the complex processes underlying observed differentials in health-seeking behaviors and illuminate potential targets for public health and clinical intervention.
View full text

Tran, L., Tran, P. & Tran, L. 2020. **A cross-sectional analysis of racial disparities in US diabetes screening at the national, regional, and state level**. Journal of Diabetes & its Complications 34(1) 107478.
AIM: To determine US diabetes screening estimates in Whites, Blacks, Hispanics, Asians, Native Hawaiians/Pacific Islanders, American Indians/Alaska Natives, and Others at the national, regional, and state level.
METHODS: In this study of 2011, 2013, 2015, and 2017 Behavioral Risk Factor Surveillance System data, we used logistic regression results to generate national, regional, and state screening marginal probabilities (average adjusted predictions (AAPs)) for each race in the two American Diabetes Association recommended screening groups[1]: asymptomatic overweight/obese people <45y with >=1 diabetes risk factor and[2] people >=45y.
RESULTS: Even after adjusting for sociodemographic and clinical factors, significant racial disparities in screening (p-value<.05) persist at all three geographic levels. Asians had the worst national, regional, and state level AAPs of all the races. Across all races, the Northeast had the highest regional screening levels (regional AAP: 48.4-78.58%) while the West had the lowest (regional AAP: 41.98-75.18%).
CONCLUSION: Study findings indicate that sociodemographic and clinical factors do not fully explain racial disparities in diabetes screening. Further research on clinician and patient attitudes towards diabetes screening are warranted in order to design and implement initiatives in US areas where certain racial groups have particularly low diabetes screening levels
View full text

Urbonas, G., Venceviciene, L., Valius, L., et al. 2020. **Primary Prevention of Cardiovascular Risk in Lithuania-Results from EUROASPIRE V Survey**. Medicina 56(3) 18.
AIM: to assess the control of lifestyle and risk factors in patients at high risk of developing CVD, as well as CVD risk perception in patients enrolled into the primary care arm of the European Action on Secondary and Primary Prevention by Intervention to Reduce Events (EUROASPIRE V) survey in Lithuania.
METHODS: Data were collected as the part of the EUROASPIRE V survey, a multicenter, prospective, cross-sectional observational study. Adults without a documented CVD who had been

prescribed antihypertensive medicines and/or lipid-lowering medicines and/or treatment for diabetes (diet and/or oral antidiabetic medicines and/or insulin) were eligible for the survey. Data were collected through the review of medical records, patients' interview, physical examination and laboratory tests. RESULTS: A total of 201 patients were enrolled. Very few patients reached targets for low-density lipoprotein cholesterol (LDL-C) (4.5%), waist circumference (17.4%) and body mass index (15.4%). Only 31% of very high CVD risk patients and 52% of high-risk patients used statins. Blood pressure target was achieved by 115 (57.2%) patients. Only 21.7% of patients at very high actual CVD risk and 27% patients at high risk correctly estimated their risk. Of patients at moderate actual CVD risk, 37.5% patients accurately self-assessed the risk. About 60%-80% of patients reported efforts to reduce the intake of sugar, salt or alcohol; more than 70% of patients were current nonsmokers. Only a third of patients reported weight reduction efforts (33.3%) or regular physical activity (27.4%). CONCLUSIONS: The control of cardiovascular risk factors in a selected group of primary prevention patients was unsatisfactory, especially in terms of LDL-C level and body weight parameters. Many patients did not accurately perceive their own risk of developing CVD.
View full text

Venkatrao, M., Nagarathna, R., Patil, S. S., et al. 2020. **A composite of BMI and waist circumference may be a better obesity metric in Indians with high risk for type 2 diabetes: An analysis of NMB-2017, a nationwide cross-sectional study**. Diabetes Research & Clinical Practice 161 108037.
AIM: to evaluate the efficacy of BMI WC, a composite measure, against BMI and WC.
METHODS: Using data from a nationwide randomized cluster sample survey (NMB-2017), we analysed 7496 adults at high risk for type 2 diabetes. WC, BMI, and BMI WC were evaluated using Odds Ratio (OR), and Classification scores (Sensitivity, Specificity,and Accuracy). These were validated using Indian Diabetes Risk Score (IDRS) by replacingWC with BMI and BMI WC, and calculating Sensitivity, Specificity, and Accuracy.
RESULTS: BMI WC had higher OR (2·300) compared to WC (1·87) and BMI (2·26). WC, BMI, and BMI WC were all highly Sensitive (0·75, 0·81, 0·70 resp.). But BMI WC had significantly higher Specificity (0.36) when compared to WC and BMI (0.27 each).IDRS WC, IDRS BMI, and IDRS BMIWC were all highly Sensitive (0·87, 0·88, 0·82 resp.). But IDRS BMIWC had significantly higher Specificity (0·39) compared to IDRS WC and IDRS BMI (0·30, 0·31 resp.).
CONCLUSIONS: Both WC and BMI are good predictors of risk for T2DM, but BMI WC is a better predictor, with higher Specificity; this may indicate that Indians withhigh values of both central (high WC) and general (BMI > 23) obesity carry higherrisk for type 2 diabetes than either one in isolation. Using BMI WC in IDRS improves its performance on Accuracy and Specificity.
View abstract

Alzubaidi, H. T., Chandir, S., Hasan, S., et al. 2019. **Diabetes and cardiovascular disease risk screening model in community pharmacies in a developing primary healthcare system: a feasibility study.** BMJ Open 9(11) e031246.
AIM: to develop an evidence-based community pharmacist-delivered screening model for diabetes and cardiovascular disease (CVD), and assess its feasibility to identify and refer patients with elevated risk.
METHODS: Pharmacist screening of adults visiting pharmacies involved history, demographics, anthropometric measurements, blood pressure and point-of-care testing including glycated haemoglobin (HbA1c) levels and lipid panel. Participants with a 10-year CVD risk >=7.5%, HbA1c level >=5.7% or American Diabetes Association (ADA) risk score >=5 points were advised to visit their physician. The primary outcomes were (1) development of UAE pharmacist-delivered screening model, (2) the proportion of screened participants identified as having high CVD risk (atherosclerotic CVD 10-year risk defined as >=7.5%) and (3) the proportion of participants identified as having elevated blood glucose (high HbA1c level >=5.7% (38.8 mmol/mol)) or high self-reported diabetes risk (ADA risk score >=5 points). Secondary outcome is participants' satisfaction with the screening.

RESULTS: The first UAE pharmacist-delivered screening model was developed and implemented. A total of 115 participants were screened, and 92.3% of the entire screening process was completed during a single visit to pharmacy. The mean duration of the complete screening process was 27 min. At-risk individuals (57.4%) were referred to their physicians for further testing, while 94.5% of participants were at least satisfied with their screening experience.

CONCLUSION: The community pharmacist-delivered screening of diabetes and CVD risk is feasible in the UAE. The model offers a platform to increase screening capacity within primary care and provides an opportunity for early detection and treatment. However, pathways for the integration of the pharmacist-delivered screening service with physicians in primary care are yet to be explored.

View full text

da Costa, F. A., Mala-Ladova, K., Lee, V., et al. 2019. **Awareness campaigns of atrial fibrillation as an opportunity for early detection by pharmacists: an international cross-sectional study**. Journal of Thrombosis & Thrombolysis 28 28.

AIM: to test a model for raising awareness of AF involving pharmacists globally; and to identify barriers and enablers to its implementation.

METHODS: A cross-sectional study was conducted during the Arrhythmia Alliance World Heart Rhythm Week. Pharmacists from 10 countries invited individuals (>= 40 years; without anticoagulation therapy of AF) to participate in the awareness campaign. Participants agreeing were engaged in the early detection of AF (EDAF) using pulse palpation. Individuals with rhythm discrepancies were referred and prospectively assessed to have information on the proportion of confirmed diagnosis, leading to estimate the detection rate. Interviews with country coordinators explored barriers and enablers to implementation.

RESULTS: The study involved 4193 participants in the awareness campaign and 2762 in the EDAF event (mean age 65.3 +/- 13.0), of whom 46.2% individuals were asymptomatic, recruited across 120 sites. Most common CHA_2DS_2-VASc risk factor was hypertension. Among 161 patients referred to physician, feedback was obtained for 32 cases, of whom 12 new arrhythmia diagnoses were confirmed (5 for AF, 2 for atrial flutter), all among elders (>= 65 years).

CONCLUSION: Qualitative evaluation suggested a local champion to enable pharmacists' success; technology enhanced engagement amongst patients and increased pharmacists' confidence in referring to physicians; interprofessional relationship was crucial in success. This study suggests pharmacists can contribute to greater outreach of awareness campaigns. Effective communication pathways for inter-professional collaboration were suggested enablers to gain full benefits of EDAF.

View full text

Edwards, L. A., Taylor, D. J., Campbell, P., et al. 2019. **Feeling the pressure: a cross-sectional study exploring feasibility of a healthcare Pop-Up for intraocular pressure measurements in shopping centres in England**. BMJ Open 9(11) e030523.

AIM: To test the hypothesis that a shopping centre Pop-Up health check combining an intraocular pressure (IOP) check with a general health check (blood pressure (BP)) is more readily accepted by the general public than an IOP check only. We investigate public awareness of IOP compared with BP and the feasibility of measuring IOP in large numbers in a Pop-Up.

METHODS: On one day we measured IOP only and on another measured BP and IOP. IOP was measured by Icare IC100 tonometer (Helsinki, Finland). Potential participants were asked about their awareness of IOP and BP and when they last visited their optometrist.

RESULTS: More people attended the combined BP + IOP days (461; 60%; 95% CI 56% to 64%) than IOP-only days (307; 40%, 95% CI 37% to 43%) over 16 days of testing. We recorded IOP in 652 participants (median (IQR) age and IOP of 54 (42 to 68) years and 13 (11 to 15) mm Hg, respectively). Fewer people reported awareness about IOP (19%, 95% CI 16% to 23%) compared with BP (71%, 95% CI 66% to 75%). Of 768 participants, 60 (8%) reported no previous optometric eye examination and 185 (24%) reported >2 years since their most recent examination.

CONCLUSION: Measuring IOP in large numbers of the public via a shopping centre Pop-Up is feasible. Public engagement was greater when a BP check was offered alongside an IOP check, suggesting unfamiliar health checks can be promoted by aligning them with a more familiar check. Our findings hint at strategies for public health schemes that engage the public with their eye health.
View full text

Fragala, M. S., Shiffman, D. & Birse, C. E. 2019. **Population health screenings for the prevention of chronic disease progression**. American Journal of Managed Care 25(11) 548-553.
AIM: to report incidence of previously unrecognized disease and investigate the expected effect of early detection and care on health outcomes.
METHODS: Laboratory evidence of prediabetes, diabetes, chronic kidney disease, and colorectal cancer was evaluated in an employee and spouse population (65% women; mean [SD] age = 46 [12] years). Expected disease progression was assessed.
RESULTS: Annual screening found laboratory evidence for 1185 previously unrecognized cases of prediabetes, 287 cases of diabetes, 73 cases of chronic kidney disease, and 669 positive colorectal screens per 10,000 people.
CONCLUSION: Early identification and appropriate medical care may delay 34 cases of end-stage kidney disease and prevent diabetes-related complications, 210 cases of diabetes, and 3 cases of late-stage colorectal cancer over 5 years per 1000 cases identified.
View abstract

Pappaccogli, M., Ravetto Enri, L., Perlo, E., et al. 2019. **Assessment of a non-physician screening program for hypertension and cardiovascular risk in community pharmacies**. Nutrition, Metabolism & Cardiovascular Diseases 29(12) 1316-1322.
AIM: to assess the feasibility of a non-physician pharmacy-based screening program and to describe the cardiovascular risk and the BP status of participating subjects.
METHODS AND RESULTS: 2731 costumers participated to the screening program, answering to a questionnaire about personal cardiovascular risk and measuring their BP with an Omron HEM 1040-E. Since no threshold for hypertension diagnosis is currently available for community pharmacies BP measurements, we assessed high BP prevalence according to 3 different cut-offs (≥140/90, ≥135/85 and ≥ 130/80 mmHg) and compared normotensives and hypertensives on major cardiovascular risk factors. According to the proposed cut-offs, prevalence of hypertension was respectively of 31%, 45% and 59.5%, and it increased among younger subjects (31-65 y) when the lowest cut-offs were applied. High BP was found in a large percentage of subjects self-declared on-/not on-treatment (uncontrolled hypertensives) or normotensives (presumptive hypertensives) and among those not aware of their own BP values (presumptive hypertensives). Prevalence of CV risk factors was higher in hypertensives than in normotensives.
CONCLUSIONS: Our findings demonstrated that a community pharmacy-based screening is feasible and attracts the interests of many subjects, improving awareness on their BP status. The screening was also showed to be useful in order to detect potentially uncontrolled and/or suspected new hypertensives, especially among young adults, to refer to general practitioners for confirmatory diagnosis or further evaluation.
View abstract

Susairaj, P., Snehalatha, C., Raghavan, A., et al. 2019. **Cut-off Value of Random Blood Glucose among Asian Indians for Preliminary Screening of Persons with Prediabetes and Undetected Type 2 Diabetes Defined by the Glycosylated Haemoglobin Criteria**. Journal of Diabetes & Clinical Research 1(2) 53-58.
AIM: to derive the values of random blood glucose (RBG) corresponding to the cut-off values of glycosylated hemoglobin (HbA1c) used to define prediabetes and diabetes.
METHODS: Based on their risk profile of developing diabetes, a total of 2835 individuals were screened for a large diabetes prevention study. They were subjected to HbA1c testing to diagnose

prediabetes and diabetes. Random capillary blood glucose was also performed. Correlation of RBG with HbA1c was computed using multiple linear regression equation. The optimal cut-off value for RBG corresponding to HbA1c value of 5.7% (39 mmol/mol), and >= 6.5% (48 mmol/mol) were computed using the receiver operating curve (ROC). Diagnostic accuracy was assessed from the area under the curve (AUC) and by using the Youden's index.

RESULTS: RBG showed significant correlation with HbA1c (r=0.40, p<0.0001). Using the ROC analysis, a RBG cut-off value of 140.5 mg/dl (7.8 mmol/L) corresponding to an HbA1c value of 6.5% (48mmol/mol) was derived. A cut-off value could not be derived for HbA1c of 5.7% (39 mmol/mol) since the specificity and sensitivity for identifying prediabetes were low.

CONCLUSION: Use of a capillary RBG value was found to be a simple procedure. The derived RBG cut-off value will aid in identifying people with undiagnosed diabetes. This preliminary screening will reduce the number to undergo more cumbersome and invasive diagnostic testing.

View full text

Verbiest-van Gurp, N., van Mil, D., van Kesteren, H. A. M., et al. 2019. **How do Dutch general practitioners detect and diagnose atrial fibrillation? Results of an online case vignette study**. BMC Family Practice 20(1) 175.

AIM: to describe current practice and to explore possible improvements to optimise AF detection.

METHODS: Between June and July 2017, we performed an online case vignette study among Dutch GPs. We aimed at obtaining at least 75 responses to the questionnaire. We collected demographics and asked GPs' opinion on their knowledge and experience in diagnosing AF. GPs could indicate which diagnostic tools they have for AF. In six case vignettes with varying symptom frequency and physical signs, they could make diagnostic choices. The last questions covered screening and actions after diagnosing AF. We compared the answers to the Dutch guideline for GPs on AF.

RESULTS: Seventy-six GPs completed the questionnaire. Seventy-four GPs (97%) thought they have enough knowledge and 72 (95%) enough experience to diagnose AF. Seventy-four GPs (97%) could order or perform ECGs without the interference of a cardiologist. In case of frequent symptoms of AF, 36-40% would choose short-term (i.e. 24-48 h) and 11-19% long-term (i.e. 7 days, 14 days or 1 month) monitoring. In case of non-frequent symptoms, 29-31% would choose short-term and 21-30% long-term monitoring. If opportunistic screening in primary care proves to be effective, 83% (58/70) will support it.

CONCLUSION: Responding GPs report to have adequate equipment, knowledge, and experience to detect and diagnose AF. Almost all participants can order ECGs. Reported monitoring duration was shorter than recommended by the guideline. AF detection could improve by increasing the monitoring duration.

View full text

Economic

Hill, N. R., Sandler, B., Mokgokong, R., et al. 2020. **Cost-effectiveness of targeted screening for the identification of patients with atrial fibrillation: evaluation of a machine learning risk prediction algorithm**. Journal of Medical Economics 23(4) 386-393.

AIM: to assess the cost-effectiveness of targeted screening, informed by a machine learning (ML) risk prediction algorithm, to identify patients with AF.

METHODS: Cost-effectiveness analyses were undertaken utilizing a hybrid screening decision tree and Markov disease progression model. Costs and outcomes associated with the detection of AF compared traditional systematic and opportunistic AF screening strategies to targeted screening informed by a ML risk prediction algorithm. Model analyses were based on adults _50 years and adopted the UK NHS perspective.

RESULTS: Targeted screening using the ML risk prediction algorithm required fewer patients to be screened (61 per 1,000 patients, compared to 534 and 687 patients in the systematic and opportunistic strategies) and detected more AF cases (11 per 1,000 patients, compared to 6 and 8 AF cases in the systematic and opportunistic screening strategies). The targeted approach demonstrated

costeffectiveness under base case settings (cost per QALY gained of £4,847 and £5,544 against systematic and opportunistic screening respectively). The targeted screening strategy was predicted to provide an additional 3.40 and 2.05 QALYs per 1,000 patients screened versus systematic and opportunistic strategies. The targeted screening strategy remained cost-effective in all scenarios evaluated.
CONCLUSIONS: Targeted screening using a ML risk prediction algorithm has the potential to enhance the clinical and cost-effectiveness of AF screening, improving health outcomes through efficient use of limited healthcare resources.
View full text

Shono, A., Kondo, M., Hoshi, S. L., et al. 2020. **Budget impact analysis reveals walk-in fingertip HbA1c testing in community pharmacies could provide a significant long-term reduction in public expenditure.** Research in social & administrative pharmacy : RSAP. 28.
AIM: to examine the effect of a subsidy program for walk-in HbA1c-testing at community pharmacies in Japan on public health care expenditure by conducting a budget impact analysis from payer's perspective.
METHODS: The study focused on Adachi Ward in Tokyo, where a pioneering subsidy program was implemented. It examined the budget impact of the subsidy program over a 15 years.
RESULTS: The total subsidy paid by the local authority during the first year was 2909 USD. Public expenditure remained positive for the first five years before becoming negative in the sixth year, eventually resulting in savings of 221,000 USD in the 15th year. The cost of treating type 2 diabetes that is detected early is offset by a reduction in expensive treatments for complicated cases.
CONCLUSION: Subsidizing walk-in fingertip HbA1c testing in community pharmacies is likely to result in a significant reduction in public expenditure over the mid-to long term. Our result suggests that a similar strategy in other areas could also have a potentially favorable budget impact.
View abstract

Qualitative

Giles, K., Ling, J. & Gordon, I. 2020. **Can point-of-care testing improve access to diagnostic screening and testing for people with learning disabilities? : exploring perspectives to improve access and equity.** Br J Learn Disabil. 48 28-46.
AIM: to explore service users' and health professionals' perspectives and experiences of adopting minimally invasive diagnostic and screening devices, known as point-of-care testing (POCT) as a means of improving access and engagement.
METHODS: Focus groups and semi-structured interviews were undertaken with attendees at a nonhealthcare day centre, specialist learning disability clinical network and national leads as well as researchers into learning disability and point-of-care issues. Thematic analysis of the data was undertaken.
RESULTS: There was a lack of awareness and experience of POCT across the users and health professionals. Despite this, on seeing the devices and discussing application there was strong support and acceptability across all participants for their use so long as individual needs were addressed. There was no consistent sense of where this testing should be done but support for the flexibility this could provide in terms of nonmedicalised locations and individual needs. Strategies for success included the use of specific adjustments such as the presence of a known carer, pre-testing information in an appropriate format and taking into account each individual's preferences.
CONCLUSION: POCT is considered a viable and useful method for improving access to testing for people with learning disabilities. Adoption barriers in implementation identified as specific to the field of learning disabilities included lack of POCT awareness and diagnostic overshadowing concerns, and adjusting for individualised needs is essential.
View full text

Gujral, G., Sawatzky, J.-A. V., Schulz, A., et al. 2020. **exploring the Perception of Personal cardiovascular Disease risk Among Female Nurses**. Canadian Journal of Cardiovascular Nursing 30(1) 10-16.
AIM: to explore actual and perceived personal risk of CVD in women across the lifespan.
METHODS: This cross-sectional survey study included a convenience sample of female registered nurses, who reported no personal history of CVD (N=816).
RESULTS: Perception of personal CVD risk was significantly related to age, fearing CVD as one's greatest health risk, discussing CVD risk with one's primary healthcare provider, and a positive family history of CVD.
CONCLUSION: This study provides novel evidence related to the perception of personal risk for CVD among women. Nurses can play a central role in improving CVD outcomes in women by advocating for more effective CVD risk assessment and awareness strategies for cardiovascular health promotion in women of all ages.
No online abstract available

Mentrup, S., Harris, E., Gomersall, T., et al. 2020. **Patients' Experiences of Cardiovascular Health Education and Risk Communication: A Qualitative Synthesis.** Qualitative Health Research 30(1) 88-104.
AIM: to explore how patients with CHD experience health education and in particular risk communication.
METHODS: A total of 2,221 articles were identified through a systematic search in five databases. 40 articles were included and synthesized using thematic analysis.
RESULTS: Findings show that both "what" was communicated, and "the way" it was communicated, had the potential to influence patients' engagement with lifestyle changes. Communication about the potential of lifestyle change to reduce future risk was largely missing causing uncertainty, anxiety, and, for some, disengagement with lifestyle change.
CONCLUSION: Health education and risk communication has the potential to influence patients' engagement and motivation to make healthy lifestyle changes to reduce future coronary risk. However, patients continue to report unmet health information needs, and detailed discussions about the potential of lifestyle change to reduce future risk were largely missing causing uncertainty, anxiety, and, for some, disengagement with lifestyle change
View full text

Hirst, J. A., Farmer, A. J. & Williams, V. 2019. **How point-of-care HbA1c testing changes the behaviour of people with diabetes and clinicians - a qualitative study.** Diabetic Medicine.
AIM: To explore adults with diabetes and clinician views of point-of-care HbA1c testing.
METHODS: Adults with diabetes and HbA1c >= 58 mmol/mol (7.5%) receiving HbA1c point-of-care testing in primary care were invited to individual interviews. Participants were interviewed twice, once prior to point-of-care testing and once after 6 months follow-up. Clinicians were interviewed once. A thematic framework based on an a priori framework was used to analyse the data.
RESULTS: Fifteen participants (eight women, age range 30-70 years, two Asians, 13 white Europeans) were interviewed. They liked point-of-care testing and found the single appointment more convenient than usual care. Receiving the test result at the appointment helped some people understand how some lifestyle behaviours affected their control of diabetes and motivated them to change behaviours. Receiving an immediate test result reduced the anxiety some people experience when waiting for a result. People thought there was little value in using point-of-care testing for their annual review. Clinicians liked the point-of-care testing but expressed concerns about costs.
CONCLUSION: This work suggests that several features of point-of-care testing may encourage behavioural change. It helped some people to link their HbA1c result to recent lifestyle behaviours, thereby motivating behavioural change and reinforcing healthy lifestyle choices.
View full text

Orchard, J., Li, J., Gallagher, R., et al. 2019. **Uptake of a primary care atrial fibrillation screening program (AF-SMART): a realist evaluation of implementation in metropolitan and rural general practice.** BMC Family Practice 20(1) 170.

AIM: The Atrial Fibrillation Screen, Management And guideline-Recommended Therapy (AF-SMART) studies of opportunistic AF screening in 16 metropolitan and rural general practices were conducted from November 2016-June 2019. These studies trialled custom-designed eHealth tools to support all stages of AF screening in general practice.

METHODS: A realist evaluation of the AF-SMART studies, which aimed to explain the circumstances in which the program worked (or not) to increase the proportion of people screened for AF. The initial program theory was based on our previous research, policy documents and screening studies. To test this, we conducted 45 semi-structured interviews with general practitioners (GPs), nurses and practice managers across all participating practices, and collected observational and quantitative screening data. These data were analysed and interpreted to refine the program theory.

RESULTS: GPs/nurses liked the eHealth tools, although technical problems sometimes disrupted screening. Time was the main barrier to screening for GPs/nurses, so systems need to be very efficient. Practices with leadership from a senior GP 'screening champion' had broader uptake, especially from the nursing team. Providing regular feedback on screening data was beneficial for quality improvement and motivation. Clear protocols for follow-up of abnormal results were required for successful nurse-led screening in a hierarchical system. Participation in the program had broader benefits of improving AF knowledge and raising the profile of cardiovascular health in the practice. Screening for a shorter, more intense period (eg during influenza vaccination) worked well for practices where sufficient staff time was allocated.

CONCLUSION: Introducing an AF screening program is likely to be successful in contexts where there is a senior GP 'screening champion', a clear protocol exists for abnormal results, and there is regular data reporting to staff. These contexts link to mechanisms around motivation, leadership, empowerment of nurses, and efficient screening systems. The contexts and mechanisms contribute to the longer-term outcomes of increasing the proportion of people screened and treated for AF, which is recommended by guidelines as a key strategy for the prevention of AF-related stroke.

View full text

Diagnostic studies

Alzeidan, R., Fayed, A., Rabiee, F., et al. 2020. **Diagnostic performance of waist-to-height ratio in identifying cardiovascular risk factors and metabolic syndrome among adult Saudis. A cross-sectional study.** Saudi Medical Journal 41(3) 253-260.

AIM: To evaluate the diagnostic performance of waist to height ratio (WHtR) to screen for cardiovascular risk factors (CVRF) and metabolic syndrome (MetS) among Saudis.

METHODS: Between June 2013 and August 2014, a cross-sectional study of 3,063 adult Saudis of both genders from King Khalid Hospital, Riyadh, Saudi Arabia was conducted. Using the "WHO STEPwise Surveillance-Instrument V2.1", which uses sequential steps including questionnaires and anthropometric and biochemical measurements of MetS and CVRF. Waist to height ratio validity in defining central obesity, MetS, and CVRF were tested using receiver operating characteristic curve (ROC), sensitivity, specificity, positive and negative predictive values, and accuracy. Using multivariate regression analyses for adjustment of confounders as age and gender were applied to compute adjusted odds ratios (aOR).

RESULTS: The diagnostic potential of WHtR was excellent for central obesity (area under the curve [AUC] = 0.98), and MetS (AUCs = 0.86); it was good for CVRF >=2 (AUCs = 0.79) and was satisfactory for dyslipidemia (AUCs = 0.66). The sensitivities and negative predictive values exceeded 85% for diagnosing central obesity, diabetes, and hypertension. Adjusted odds ratios for age and gender showed that WHtR >=0.50 significantly increased the risk of diabetes, hypertension, and >=2 CVRF by almost 4-fold, and increased the risk of dyslipidemia by 2-fold.

CONCLUSION: Waist height ratio showed a good diagnostic performance for CVRF and MetS among Saudis. Furthermore, WHtR >=0.5 increased the risk of dyslipidemia, diabetes mellitus and hypertension.
View abstract

Diamantino, A. C., Nascimento, B. R., Beaton, A. Z., et al. 2020. **Atrial fibrillation detection with a portable device during cardiovascular screening in primary care.** Heart 04 04.
AIM: to evaluate a novel handheld dual-electrode stick is a portable atrial fibrillation (AF) screening device (AFSD) in primary care patients referred for echocardiogram (echo).
METHODS: The AFSD has a light indication of irregular rhythm and single-lead ECG recording. Patients were instructed to hold the device for 1 min, and AF indication was recorded. A 12-lead ECG was performed for all AFSD-positive patients and 250 patients with negative AFSD screen. Echos were performed based on a clinical risk score: all high-risk patients and a sampling of low-risk patients underwent complete echo. Intermediate risk patients first had a screening echocardiogram, with a follow-up complete study if abnormality was suspected.
RESULTS: In 5 days, 1518 patients underwent clinical evaluation and cardiovascular risk stratification: mean age 58+/-16 years, 66% women. The AFSD was positive in 6.4%: 12.6% high risk, 6.1% intermediate risk and 2.2% low risk. Older age was a risk factor (9.3% vs 4.8% in those more than and less than 65 years, p=0.001). AFSD positive was independently associated with heart disease in echo (OR=3.9, 95% CI 2.1 to 7.2, p<0.001). Compared with 12-lead ECG, the AFSD had sensitivity of 90.2% (95% CI 77.0% to 97.3%) and specificity of 84.0% (95% CI 79.3% to 88.0%) for AF detection.
CONCLUSION: AFSD demonstrated high sensitivity for AF detection in primary care patients referred for echo. AF prevalence was substantial and independently associated with structural or functional heart disease, suggesting that AFSD screening could be a useful primary care tool to stratify risk and prioritise echo.
View full text

Sharma, A., Giannetti, N., Buckridge, D., et al. 2020. **Artificial Intelligence-Enabled Ecg Algorithm for the Screening of Diabetes.** Journal of the American College of Cardiology 75 (11) 3542.
AIM: to develop an artificial intelligence (AI) based electrocardiogram (ECG) algorithm to screen patients for DM.
METHODA: A convolutional neural network was used to identify diabetes using ECG signal data in the CARTeGENE registry (population-based study in Quebec, Canada). In the registry, 7,460 participants had 6-lead ECGs (500 hz, 10s, with peripheral limb leads). A neural network was trained to minimize cross entropy loss. Hyperparameters describing the structure of the network (regularization strength and learning dynamics) were optimized using a Bayesian Optimization framework to select the best performing model with respect to a mean over the area under the receiver operating curve (AUROC). The resulting performance was presented over 5 folds of cross validation.
RESULTS: Of the participants with ECGs, 8% patients had diabetes; 20% of the ECG data was reserved for validation. A fold maximally identified an AUROC of 0.77, F1 score 0.29, sensitivity 0.724, positive predictive value (PPV) 0.18. specificity 0.66, and negative predictive value (NPV) 0.96. Across a five-fold cross validation set the mean AUROC was 0.76 (SD 0.01), F1 score 0.30 (SD 0.02), sensitivity 0.67 (SD 0.05), PPV 0.20 (SD 0.02), specificity 0.72 (SD 0.04), and NPV 0.95 (SD 0.01)(figure).
CONCLUSION: An AI based ECG-algorithm may be used for population screening of DM and to identify digital biomarkers of DM.
View abstract

Takakado, M., Takata, Y., Yamagata, F., et al. 2020. **Simple and non-invasive screening method for diabetes based on myoinositol levels in urine samples collected at home**. BMJ Open Diabetes Research & Care 8(1) 02.

AIM: To establish a simple screening method for diabetes based on myoinositol (MI) in urine samples collected at home.

METHODS: Initially, we evaluated the stability of urinary MI (UMI) at room temperature (RT; 25degreeC) and 37degreeC in 10 outpatients with type 2 diabetes. We then enrolled 115 volunteers without a current or history of diabetes. In all subjects, glucose intolerance was diagnosed by 75 g oral glucose tolerance test (75gOGTT). To assess the association between UMI or urine glucose (UG) and plasma glucose (PG), urine samples were also collected at 0 and 2 hours during 75gOGTT. All the subjects collected urine samples at home before and 2 hours after consuming the commercially available test meal. UMI levels at wake-up time ($UMI_{wake-up}$), before ($UMI_{premeal}$) and 2 hours after the test meal ($UMI_{2h-postprandial}$) were measured using an enzymatic method. DELTAUMI was defined as $UMI_{2h-postprandial}$ minus $UMI_{premeal}$.

RESULTS: Differing from UG, UMI was stable at RT and 37degreeC. UMI was increased linearly along with an increase in PG, and no threshold for UMI was observed. UMI was closely associated with blood glucose parameters obtained from a 75gOGTT and hemoglobin A1c (HbA1c) at hospital after adjustment for age, sex, body mass index and serum creatinine. $UMI_{wake-up}$, $UMI_{premeal}$, $UMI_{2h-postprandial}$ and DELTAUMI at home were higher in diabetic subjects than non-diabetic subjects even after the above adjustment. Receiver operating characteristics curve (ROC) analyses revealed that for the screening of diabetes, the area under the curve for ROC for $UMI_{2h-postprandial}$ and DELTAUMI (0.83 and 0.82, respectively) were not inferior to that for HbA1c >=48 mmol/mol, which is the American Diabetes Association (ADA) criteria for diabetes.

CONCLUSION: MI measurement in urine samples collected at home before and after the meal would be a simple, non-invasive and valuable screening method for diabetes.

View full text

Thirunavukkarasu, U., Umapathy, S., Krishnan, P. T., et al. 2020. **Human Tongue Thermography Could Be a Prognostic Tool for Prescreening the Type II Diabetes Mellitus**. Evidence-based Complementary and Alternative Medicine 2020 (no pagination)(3186208).

AIM: to (i) analyse and classify diabetes based on thermal variations at human tongue, (ii) segment the hot spot regions from tongue thermogram by RGB (red, green, blue) based color histogram image segmentation method and extract the features using gray level co-occurrence matrix algorithm, (iii) classify normal and diabetes using various machine learning algorithms, and (iv) develop computer aided diagnostic system to classify diabetes mellitus.

METHODS: The baseline measurements and tongue thermograms were obtained from 140 subjects.

RESULTS: The measured tongue surface temperature of the diabetic group was found to be greater than normal. The statistical correlation between the HbA_{1c} and the thermal distribution in the tongue region was found to be r^2 = 0.5688. The Convolutional Neural Network has outperformed the other classifiers with 94.28% accuracy rate.

CONCLUSION: Thus, tongue thermograms could be used as a preliminary screening approach for diabetes prognosis.

View full text

Usui, T., Yoshida, Y., Nishi, H., et al. 2020. **Diagnostic accuracy of urine dipstick for proteinuria category in Japanese workers**. Clinical & Experimental Nephrology 24(2) 151-156.

AIM: Urine dipstick tests are often used to evaluate proteinuria during health checkups. We examined the dipstick's accuracy in assessing the proteinuria levels among Japanese workers.

METHODS: We assessed subjects aged >= 18 years who had a health checkup at the University of Tokyo in 2016 or 2017 (n = 5383). Proteinuria was stratified by urine protein-to-creatinine ratio (PCR):

A1, < 150 mg/gCre; A2, 150-499 mg/gCre; and A3, >= 500 mg/gCre. The accuracy of a dipstick result of +/- or higher to detect a PCR level of >= A2 was examined. We compared changes in dipstick results and PCR level in 136 subjects evaluated twice with a median interval of 119 days.
RESULTS: The subjects' mean age was 40 years, and half were women. The dipstick results were - in 94.9%, +/- in 4.1%, and >= 1 + in 1.0%. The PCR level was A1, A2, A3 in 98.6%, 1.2%, and 0.2% of the subjects, respectively. The sensitivity, specificity, and positive and negative predictive values of a +/- or higher dipstick result to detect A2 or higher were 66.2%, 95.6%, 17.5%, and 99.5%, respectively. Among the 136 subjects examined twice, 134 (98.5%) had no change in PCR level (A1 in all cases) despite a decrease or increase in dipstick results.
CONCLUSION: Urine dipstick results of +/- or above had a high specificity but low sensitivity and positive predictive value to detect PCR proteinuria of A2 or higher. Confirmation by quantitative protein measurement should be recommended for individuals at high risk of chronic kidney disease.
View full text

Zaprutko, T., Zaprutko, J., Baszko, A., et al. 2020. **Feasibility of Atrial Fibrillation Screening With Mobile Health Technologies at Pharmacies**. Journal of Cardiovascular Pharmacology and Therapeutics 25(2) 142-151.
AIM: to evaluate the smartphone-based electrocardiogram (ECG) recordings aimed at AF screening at Polish pharmacies.
METHODS: Prospective AF screening among patients aged 65 years was conducted at 10 pharmacies using Kardia Mobile with a dedicated application (Kardia app). Prior AF was a study exclusion criterion. CHA2DS2-VASc score (congestive heart failure, hypertension, age, diabetes mellitus, previous stroke/transient ischemic attack, female sex, and vascular disease) has been collected from every patient. A single-lead ECG has been acquired by the placement of fingers from each hand on the pads. Kardia app diagnosis has been evaluated by the cardiologist.
RESULTS: A total of 525 ECGs were performed. Kardia app diagnosis was provided in 490 cases. In 437 (89.18%) cases, it was "normal" rhythm, in 17 (3.47%) recordings "possible AF," in 23 (4.69%) ECGs "unreadable," and in 13 (2.65%) "unclassified". After the cardiologist reevaluation, the new AF was identified in 7 (1.33%) patients. Sensitivity and specificity of Kardia app in detecting AF was 100% (95% confidence interval [CI]: 71.5%-100%) and 98.7% (95% CI: 97.3%-99.5%), respectively. The positive predictive value was 64.7% (95% CI: 38.3%-85.7%) and the negative predictive value was 100% (95% CI: 99.2%-100%). CHA2DS2-VASc score was 2.14+0.69 for those with new AF and 3.33+1.26 in the non-AF group.
CONCLUSION: Kardia app is capable of fast screening and detecting AF with high sensitivity and specificity. The possible diagnosis of AF deserves additional cardiological evaluation. The results obtained in patients with low CHA2DS2-VASc score and "silent" AF confirm the importance of routine AF screening. Cardiovascular screening with the use of mobile health technology is feasible at pharmacies.
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Brunner, F. J., Waldeyer, C., Ojeda, F., et al. 2019. **Application of non-HDL cholesterol for population-based cardiovascular risk stratification: results from the Multinational Cardiovascular Risk Consortium**. The Lancet 394(10215) 2173-2183.
AIM: To investigate the cardiovascular disease risk associated with the full spectrum of bloodstream non-HDL cholesterol concentrations.
METHODS: In this risk-evaluation and risk-modelling study, we used Multinational Cardiovascular Risk Consortium data from 19 countries across Europe, Australia, and North America. Individuals without prevalent cardiovascular disease at baseline and with robust available data on cardiovascular disease outcomes were included. The primary composite endpoint of atherosclerotic cardiovascular disease was defined as the occurrence of the coronary heart disease event or ischaemic stroke. Sex-specific multivariable analyses were computed using non-HDL cholesterol categories according to the

European guideline thresholds, adjusted for age, sex, cohort, and classical modifiable cardiovascular risk factors. In a derivation and validation design, we created a tool to estimate the probabilities of a cardiovascular disease event by the age of 75 years, dependent on age, sex, and risk factors, and the associated modelled risk reduction, assuming a 50% reduction of non-HDL cholesterol.
RESULTS: Of the 524 444 individuals in the 44 cohorts in the Consortium database, we identified 398 846 individuals belonging to 38 cohorts (184 055 [48·7%] women; median age 51·0 years [IQR 40·7–59·7]). 199 415 individuals were included in the derivation cohort (91 786 [48·4%] women) and 199 431 (92 269 [49·1%] women) in the validation cohort. During a maximum follow-up of 43·6 years (median 13·5 years, IQR 7·0–20·1), 54 542 cardiovascular endpoints occurred. Incidence curve analyses showed progressively higher 30-year cardiovascular disease event-rates for increasing non-HDL cholesterol categories (from 7·7% for non-HDL cholesterol <2·6 mmol/L to 33·7% for ≥5·7 mmol/L in women and from 12·8% to 43·6% in men; $p<0·0001$). Multivariable adjusted Cox models with non-HDL cholesterol lower than 2·6 mmol/L as reference showed an increase in the association between non-HDL cholesterol concentration and cardiovascular disease for both sexes (from hazard ratio 1·1, 95% CI 1·0–1·3 for non-HDL cholesterol 2·6 to <3·7 mmol/L to 1·9, 1·6–2·2 for ≥5·7 mmol/L in women and from 1·1, 1·0–1·3 to 2·3, 2·0–2·5 in men). The derived tool allowed the estimation of cardiovascular disease event probabilities specific for non-HDL cholesterol with high comparability between the derivation and validation cohorts as reflected by smooth calibration curves analyses and a root mean square error lower than 1% for the estimated probabilities of cardiovascular disease. A 50% reduction of non-HDL cholesterol concentrations was associated with reduced risk of a cardiovascular disease event by the age of 75 years, and this risk reduction was greater the earlier cholesterol concentrations were reduced.
CONCLUSION: Non-HDL cholesterol concentrations in blood are strongly associated with long-term risk of atherosclerotic cardiovascular disease. We provide a simple tool for individual long-term risk assessment and the potential benefit of early lipid-lowering intervention. These data could be useful for physician–patient communication about primary prevention strategies.
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Muchira, J. M., Gona, P. N., Leveille, S., et al. 2019. **A Review of Methodological Approaches for Developing Diagnostic Algorithms for Diabetes Screening**. Journal of Nursing Measurement 27(3) 433-457.
AIM: to evaluate and identify the most robust methodological approaches for developing diagnostic algorithms for screening diabetes.
METHODS: Following a literature search, methodological quality of algorithm development studies was evaluated using the TRIPOD guidelines (Collins, Reitsma, Altman, & Moons, 2015).
RESULTS: Methods used for developing the algorithms included logistic regression models, classification and regression trees, Random Forest and TreeNet, Artificial Neural Networks, and Naive Bayes. Methodological issues for algorithm development studies were related to handling of missing values, reporting recruitment methods, categorization of continuous variables, and statistical controls.
CONCLUSION: Most studies exhibited critical methodological flaws and poor adherence to reporting standards. Diabetes screening algorithms can easily be availed electronically and utilized by nurses at minimal cost even in underserved areas.
View abstract

Ongoing research

CT.gov 2020. **Proactive Cardiovascular Prevention Strategy in Subjects With High Genetic Risk.** Clinical Trials.gov. NCT04291157.
AIM: A polygenic risk score (PRS) will be developed and implemented into the primary care digital work-flow.
METHODS:1000 study subjects with no known cardiovascular disease, diabetes or statin treatment and with high PRS (men of 30-65, women of 40-70 years of age) will be recruited from amongst the gene donors of Estonian Biobank (Estonian Genome Center at the University of Tartu). Subjects will

be randomised to proactive primary preventive intervention incorporating provision of PRS information or usual care (opportunistic preventive strategy). Subjects in intervention group will be actively contacted and invited to a GP based prevention intervention of total cardiovascular risk scoring and guideline recommended preventive measures. Subjects in control group will be observed for 12 month and then invited to a GP visit and provided the same information and advice as the intervention group. The impact of PRS on total 10 year CVD risk scoring will be assessed, the change in total 10 year CVD risk during the intervention will be measured and the difference in total 10 year CVD risk between the groups at month 12 will be reported. Satisfaction of subjects and GPs with the intervention will also be assessed as well as cost-effectiveness of the intervention.
View abstract

Nahar, P., van Marwijk, H., Gibson, L., et al. 2020. **A protocol paper: community engagement interventions for cardiovascular disease prevention in socially disadvantaged populations in the UK: an implementation research study.** Global Health Research and Policy 5 12.
AIM: This protocol paper sets out a UK-based study (Sussex and Nottingham) aiming to co-produce a community delivered CVD risk assessment and coaching intervention to support community members to reduce their risk of CVD. The overall aim of the project is to implement a tailored-to-context community engagement (CE) intervention on awareness of CVD risks in vulnerable populations in high, middle and low-income countries. The specific objectives of the study are to enhance stakeholder' engagement; to implement lifestyle interventions for cardiovascular primary prevention, in disadvantaged populations and motivate uptake of NHS health checks.
METHODS: This study uses both qualitative and quantitative methods in three phases of evaluation, including pre-, per- and post-implementation. To ensure contextual appropriateness the 'Scaling-up Packages of Interventions for Cardiovascular disease prevention in selected sites in Europe and Sub-Saharan Africa: An implementation research' (SPICES) project will organize a multi-component community-engagement intervention. For the qualitative component, the pre-implementation phase will involve a contextual assessment and stakeholder mapping, exploring potentials for CVD risk profiling strategies and led by trained Community Health Volunteers (CHV) to identify accessibility and acceptability. The per-implementation phase will involve healthy lifestyle counselling provided by CHVs and evaluation of the outcome to identify fidelity and scalability. The post-implementation phase will involve developing sustainable community-based strategies for CVD risk reduction. All three components will include a process evaluation. A stepped wedge cluster randomised trial of the roll out will focus on implementation outcomes including uptake and engagement and changes in risk profiles. The quantitative component includes pre and post-intervention surveys. The theory of the socio-ecological framework will be applied to analyse the community engagement approach.
DISCUSSION: Based on the results ultimately a sustainable community engagement-based strategy for the primary prevention of CVD risk will be developed to enhance the performance of NHS health care in the UK. The Trial Registration number is ISRCTN68334579.
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