

ARTICLE

Efforts to close the evidence-practice gap in the management of cardiovascular risk factors in general practice: strategic or haphazard?

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Abstract

Rational, aims and objectives: Guidelines for best practice management of cardiovascular disease (CVD) risk factors such as smoking, high blood pressure, high cholesterol, risky alcohol consumption, diabetes and obesity are in place in the primary care setting, yet many of these risk factors remain uncontrolled. This review examined: a) trends in the number of published provider-focussed intervention studies which aimed to improve the identification and management of modifiable CVD risk factors in primary care; b) the proportion of primary care research effort directed toward improving provider management of each CVD risk factor compared to the mortality burden associated with each risk factor in high income countries.

Methods: An electronic database search of Medline, Cinahl and PsychInfo was conducted for the time period January 1st 1999 to 31st December 2010 to identify relevant articles.

Results: There was a trend toward an increase in the number of provider-focussed interventions to improve the management of CVD risk factors in general practice over time. The proportion of research effort directed to risk factors varied between 6% for alcohol and obesity to 32% for high blood pressure. High blood pressure and smoking had the highest and second highest proportion of research effort and were ranked second and first, respectively, in terms of mortality burden.

Conclusions: The allocation of research effort appears somewhat consistent with the health burden associated with the risk factors examined in this review, although an increase in smoking-related research may be needed.

Keywords

Cardiovascular disease, guidance adherence, person-centered medicine, primary care, risk factors

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Introduction

Despite cardiovascular disease (CVD) being largely preventable, it is the leading cause of death worldwide [1].

Simulation models suggest that if everyone received preventive care in line with current best evidence, myocardial infarction would be reduced by 63% and stroke would be reduced by 31% [2]. Modifiable risk factors for

CVD include smoking, hypertension, weight to hip ratio, diet, physical activity, alcohol consumption, diabetes and cholesterol levels [3]. Over 90% of the risk of an initial acute myocardial infarction is attributable to modifiable risk factors, with smoking and blood lipids as the strongest predictors [3]. Risk of CVD increases with number of risk factors [4], indicating the importance of screening and management of all modifiable risk factors [4].

Role of general practitioners in management of CVD risk factors

General practitioners (GPs) see a broad cross section of the community [5,6]. In a given year, approximately 85% of people will consult a GPs at least once [7]. As such, GPs are well placed to provide preventive care and management of CVD risk factors. Both patients and GPs see preventive care as a key part of the GPs' role and it is also a key component of person-centered medicine [8-10].

Opportunities to manage CVD risk factors in a general practice setting are plentiful. Approximately 49% of general practice patients have at least one modifiable risk factors for CVD [7], while 78% have 3 or more [11]. Identification and/or management of risk factors such as obesity, smoking, risky alcohol consumption, high blood pressure and high cholesterol in primary care settings has been recommended by leading health authorities for many years [12-14].

Persistent evidence-practice gap in primary care management of CVD risk factors needs to be addressed

Despite a clear role for GPs in the prevention of CVD, rates of uncontrolled risk factors among general practice patients are high. A large scale UK study of over 570,000 general practice patients found that among those with three or more CVD risk factors, including hypertension, only 68% received anti-hypertensive treatment and only 24% received lipid lowering treatment [15]. Other studies have shown that hypertension remains uncontrolled in 30% [16] to 50% [17] of patients. Studies have indicated that GPs detect less than 30% of those with risky alcohol consumption [18] and only 10.5% reported offering thorough cessation counselling [19]. In an Australian study, only 34% of GPs reported offering smokers cessation advice [20]. Despite its prevalence, obesity is seldom noted in medical records and less than 30% of patients are advised on specific weight-loss strategies by their GPs [21]. There are clear defects in a person and people-centered approach to patient care.

What sort of research efforts are needed to improve outcomes in CVD?

Where best evidence is not being routinely implemented in primary care, there is a need to develop effective interventions to improve its implementation. Further, it may be expected that a greater proportion of the research effort might be directed towards those risk factors associated with a higher mortality and morbidity burden, such as smoking and high blood pressure. This review examined the number of published provider-focussed intervention studies which aimed to improve the identification and management of modifiable CVD risk factors in primary care from 1999 to 2010. 1999 was selected as the earlier time period, given that recommendations for the management of all the risk factors targeted in this review were published by leading health authorities at or before 1996. The risk factors included in the review were smoking, high blood pressure, diabetes, high cholesterol, obesity and risky alcohol consumption. The review also aimed to compare the relative proportion of the research effort directed toward improving management of each risk factor and to compare this to global mortality burden associated with each risk factor. It was anticipated that: a) there would be an increase over time in the number of rigorous provider-focussed interventions aiming to improve each type of CVD risk factor and b) a greater proportion of intervention studies would be directed toward improving management of risk factors associated with a higher mortality burden (e.g. smoking), compared to those related to a lower mortality burden (e.g. risky alcohol consumption).

Method

Database search

An electronic database search of Medline, Cinahl and PsychInfo was conducted for the time period January 1st 1999 to 31st December 2010 using the following search terms: General practice or Primary Care search terms (Physicians, Family/ OR Family Practice/ OR Education, Medical, Continuing/ OR Practice Guidelines/ OR Guideline Adherence/ OR Physician-Patient Relations/ OR Physician Practice Patterns OR General practi\$.mp OR Doctor*.mp) were combined with CVD risk factors terms. (Obesity/ OR Morbid Obesity/ or Overweight.mp) OR (Hypocholesterolaemia/ OR Hyperlipidemia+ / OR High blood cholesterol.mp) OR (Hypertension+ / OR Blood Pressure+) OR (Alcohol Drinking/ OR Binge drinking.mp/ OR Risky Drinking.mp/ OR Alcohol Abuse/ OR Alcohol Intoxication/ OR Alcohol consumption.mp/ OR Problem drinking.mp) OR (Diabetes Mellitus+ / OR Blood glucose)

OR (Smoking / OR Smoking Cessation). The following limits were placed on the search: human, adults, clinical trials, comparative studies, controlled clinical trials, multicentre trials, randomized controlled trial and all type of US Government research support articles.

Papers were eligible for inclusion if they met the following criteria: 1) published in a peer-reviewed journal between 1st January 1999 and 31st December 2010; 2) reported on the evaluation of an intervention to change provider behaviour in relation to primary care management of modifiable CVD risk factors; 3) used a research design accepted by the Cochrane Effective Practice and Organisation of Care group (EPOC) and 4) published in English. The search focussed on identifying papers related to the following modifiable risk factors: smoking, obesity, risky alcohol consumption, high blood pressure, high cholesterol and diabetes. The following definitions were used to code papers.

Coding of risk factors targeted by the intervention

Each paper was examined to identify each risk factor(s) that the intervention targeted from among: smoking, obesity, alcohol, diabetes, high cholesterol and high blood pressure. If an intervention targeted multiple risk factors it was counted once for each risk factor it targeted.

Coding of study design

Those studies identified as having some component of the intervention aimed at changing general practitioners' behaviour were reviewed in detail. Study design was coded as one of four designs accepted by the Cochrane Effective Practice and Organisation of Care Group (EPOC) [22].

Randomized controlled trial

A trial in which participants were randomly assigned to one of two or more experimental conditions.

Controlled clinical trial

A trial in which participants were assigned to one of two or more experimental conditions using a quasi-random method (e.g. alternation).

Controlled before and after study

A study where intervention and control groups are assigned by a non-random method. Baseline and post-test measures in the outcome of interest are collected contemporaneously in the intervention and control groups.

Interrupted time series

A study where the outcome of interest is monitored over time to determine whether there is a change in trend that may be attributable to the intervention.

Other

Any intervention studies not meeting one of the above study designs were coded as 'other'.

Quality assurance of coding

Abstracts were reviewed by one researcher and full text articles of potentially relevant articles were retrieved. Papers were coded with respect to research design and risk factor focus. Studies which targeted more than one risk factor were "counted" for each risk factor. As a quality assurance measure, 25% of the abstracts were reviewed and coded independently by a second reviewer. Differences in coding were resolved by mutual discussion. Inter-rater agreement was calculated using kappa statistic. A Kappa statistic of 0.895 was calculated indicating a high level of inter-rater agreement.

Comparison to Mortality Burden in High Income Countries

The proportion of primary care research effort directed toward improving provider management of each CVD risk factor was compared to the proportion of mortality burden associated with each CVD risk factor for high income countries (classified as a gross national income per capita of US\$ 100,666 or more, in 2004).

Results

Of the 3493 papers identified by the review; 578 did not examine a modifiable CVD-related risk factor in general practice patients, 624 did not report on primary data (e.g. case studies, letters, review), 1857 did not report on a provider-focused intervention; 1 was not published in a peer-reviewed journal; 3 were not published in English, 136 were duplicates, 78 were not conducted in adult patients, 62 examined allied health delivered interventions. The remaining 154 papers were reviewed in detail to determine whether they met EPOC study design criteria.

A total of 83 papers met the inclusion criteria. The number of eligible studies ranged from zero to 10 per calendar year, with an average of 6.38 (SD = 3.36). Poisson regression was used to estimate the average annual change in the number of studies over time and this indicated there was a statistically significant increase.

Figure 1. Flow chart showing process for identification of relevant studies

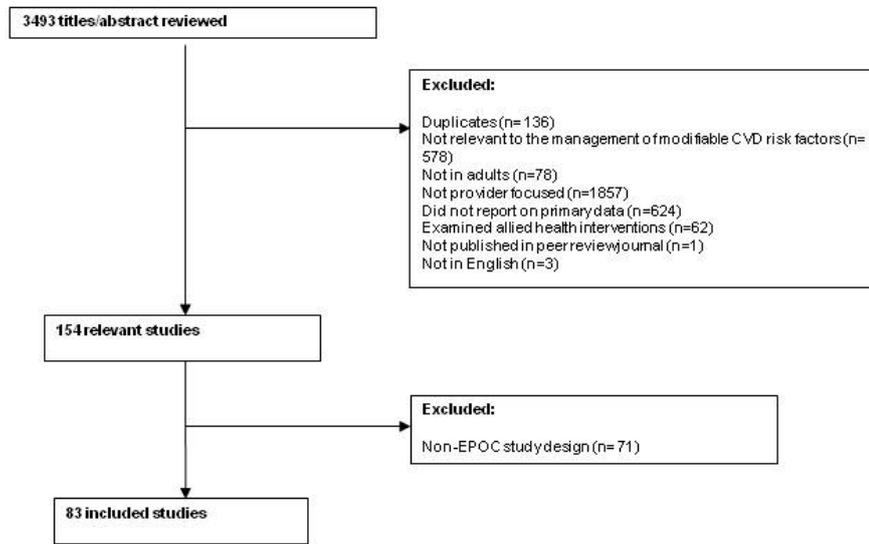
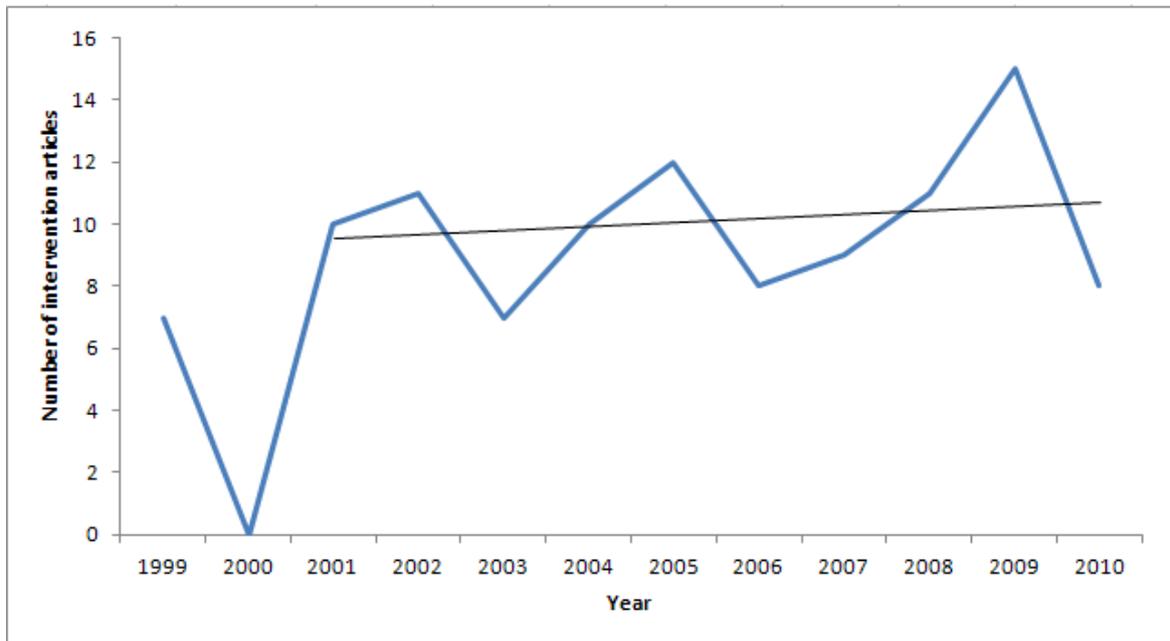


Figure 2. Trends in the total number of rigorous provider-focussed intervention studies aimed at improving management of CVD risk factors in general practice



However, there were no studies published in 2000, which appeared inconsistent with the other years. When the analysis was re-run excluding the data for 2000, the trend was no longer significant and its magnitude was attenuated (Figure 2).

The breakdown of number and proportion of studies each year for each risk factor is presented in Table 1. Interventions which targeted more than one risk factor were “counted” once for each risk factor. The greatest

number of studies targeted high blood pressure (35), followed by smoking (26) and cholesterol (16). Data regarding the mortality burden due to these CVD risk factors in high income countries were compared to the proportion of research effort directed toward each risk factor in Table 2. As shown in Table 2, the risk factors associated with highest proportion of research effort, high blood pressure and smoking, were also ranked second and first in term of mortality burden.

Table 1. Number and proportion of methodologically rigorous provider-focussed interventions by year for each risk factor.

	1999 n (%)	2000 n (%)	2001 n (%)	2002 n (%)	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	TOTAL
Alcohol	1 (14)				1 (14)		3 (25)	1 (13)					6
Blood Pressure	2 (29)		3 (30)	3 (27)	1 (14)	4 (40)	4 (33)	2 (25)	3 (33)	3 (33)	7 (39)	3 (38)	35
Cholesterol	3 (43)		2 (20)	1 (9)	1 (14)	1 (10)	3 (25)				4 (22)	1 (13)	16
Diabetes			4 (40)	2 (18)	1 (14)	2 (20)	1 (8)	1 (13)	1 (11)	2 (22)	4 (22)	2 (25)	20
Obesity					1 (14)	1 (10)				2 (22)	2 (11)		6
Smoking	1 (14)		1 (10)	5 (46)	2 (29)	2 (20)	1 (8)	4 (50)	5 (55)	2 (22)	1 (6)	2 (25)	26
TOTAL	7	0	10	11	7	10	12	8	9	9	18	8	109

Table 2. Proportion of intervention research and mortality burden in high income countries for modifiable CVD risk factors

Risk Factor	% of intervention research effort (rank)	Mortality % (rank) ⁽³²⁾
High blood pressure (hypertension)	32 (1)	16.8 (2)
Smoking	24 (2)	17.9 (1)
Diabetes	18 (3)	2.6 (5)
High cholesterol	15 (4)	5.8 (4)
Alcohol	6 (5)	1.6 (6)
Overweight/Obesity	6 (5)	8.4 (3)

Discussion

Results of this review indicate that the number of studies attempting to improve provider detection and management of modifiable CVD risk factors over the last ten years has remained fairly stable. The proportion of research effort directed at each of the risk factors examined varied from 6% for each of alcohol and obesity, to 32% for high blood pressure.

How does the focus research effort correspond to mortality and morbidity burden?

The ranked proportion of research effort directed at each intervention factor appeared to be similar to the mortality burden associated with each risk factor. For example, two risk factors with the highest associated mortality (smoking and blood pressure) were associated with the highest-ranked proportion of research effort (see Table 2). Although the proportions calculated for research effort are not likely to be highly precise estimates of true research effort, a comparison of these with mortality data (see Table

2), suggests that a disproportionately high research effort may be directed towards risk factors such as high blood pressure, high cholesterol and diabetes. Given this variation and continued high disease burden associated with CVD, it is timely to consider which factors may account for these findings. One possible explanation for the apparently greater research effort in relation to blood pressure, cholesterol and diabetes is the funding available from pharmaceutical companies for trialling prescribed medications for these conditions. Such funding may be less likely to be available for risk factors such as obesity and alcohol intake. It is also possible that other factors such as incidence and the availability of effective patient-focussed interventions also contributed to determining the research effort directed toward particular risk factors. Therefore, such evidence is discussed separately below in relation to each risk factor, in order of proportion of research effort.

High blood pressure

A relatively high proportion of the research effort was directed towards high blood pressure. Studies indicate varying trends in the prevalence of high blood pressure, with declines reported in the USA [23], relative stability in the UK [15] and increases in prevalence observed in

Canada [24,25]. Studies indicate that over the same period of time patient awareness of [25] and provider detection of high blood pressure has improved [15]. This may in part be a reflection of the relatively high proportion of research effort observed in this review. Therefore, it could be debated whether a greater proportion of research effort should be directed towards smoking, for example, rather than high blood pressure.

Smoking

While smoking is associated with the highest mortality and morbidity burden in high income countries among the risk factors examined in this review, it was ranked only second in terms of research effort. Over the last 20 years, the prevalence of cigarette smoking has declined substantially in many countries such as the United States [26], Australia [27], Canada [24], as well as parts of Asia [28] and Europe [29]. In many cases, these decreases have been attributed to public health campaigns and regulatory changes [28,30]. The focus on population-based smoking cessation interventions such as mass media campaigns [31] may in part account for lesser emphasis on smoking cessation interventions in the general practice setting. Despite declines in smoking prevalence, smoking is responsible for around 30% of deaths in the USA [30] and internationally represents the major single preventable cause of mortality and morbidity [32]. Therefore, a continued or increased focus on improving smoking cessation in the primary care setting appears warranted.

Diabetes

Diabetes was ranked fourth highest in terms of research effort, but was ranked fifth highest in terms of mortality burden (Table 2). However, there has been a dramatic rise in the prevalence of diabetes over the recent years [24,33]. Based on current trends, diabetes prevalence is expected to continue to rise over the next 20 years [34-36]. Therefore, it appears appropriate to have a substantial proportion of the research effort directed toward this growing health problem.

High cholesterol

Prevalence of dyslipidemia has increased over the past 10 years [15] and despite the availability of effective pharmacological treatments [37], remains poorly controlled among primary care patients [15]. The increase in prevalence together with continued poor management suggests that research efforts to improve best practice care for dyslipidemia should increase.

Alcohol

Alcohol is associated with a relatively low mortality burden and the proportion of research effort directed at improving management of risky alcohol consumption remained low over the period of the review. Similar to smoking, however, this may be due to the focus on population-based interventions, such as regulatory policies related to pricing and alcohol licensing as a way of reducing its impact on health [38,39].

Obesity

Obesity is associated with the third highest mortality burden in developed countries [32]. Despite this, the proportion of studies to influence provider practice in relation to obesity management was also low. Lifestyle interventions involving exercise and healthy diet are effective in reducing weight and CVD risk [40]. However, there is inconsistent evidence in relation to the clinical benefit associated with pharmacological interventions for obesity [41,42]. Further, relatively few obesity management interventions have been evaluated in the primary care setting [43]. Therefore, the limited evidence base for effective management of obesity in the primary care setting may account for the paucity of studies attempting to improve implementation of best practice obesity care.

Implications for prevention of CVD

If research is to make its maximum contribution to improving the detection and management of CVD risk factors in primary care, it should target those risk factors which are most prevalent, associated with the greatest disease burden and for which there is good evidence for interventions that are effective at reducing the risk factor. It appears that the relative focus of research on improving CVD risk factor management is mostly, but not completely, consistent with these principles. Most notably, an increase in the proportion of research devoted to smoking may increase the potential to have a substantial impact on prevention of CVD and related diseases. The small proportion of research devoted to obesity (6%) is notable, but likely to reflect the need to develop a stronger evidence base for patient-focussed interventions before attempting to improve provider management.

Limitations

This review sought to examine the relative proportion of published research focussed on modifiable risk factors for CVD. It is possible that inclusion of grey literature may have picked up additional studies relevant to the review. It is unlikely, however, that this would have substantially changed the proportion of research devoted to each of the

risk factors of interest. The use of number of published papers as a proxy for research effort does have some weaknesses and should be interpreted as a general indicator rather than a statistically precise estimate.

It is possible that factors which were not examined in this review may have influenced the level of research activity directed toward each of the risk factors of interest. For example, the proportion of morbidity burden in terms of disability adjusted life years varies between 2.8% for diabetes and 10.7% for smoking for the risk factors examined in this review [32]. Similarly, the availability of government funding and infrastructure to support research in primary care [44] and GP interest in particular research topics [45] may also play a role in determining research effort.

Conclusions

Primary care offers promising opportunities for prevention of CVD through early detection and management of modifiable risk factors for CVD. This review indicated that there are relatively few studies on improving the management of CVD risk factors in the primary care setting. The allocation of research effort appears somewhat consistent with the health burden associated with the risk factors examined in this review, although an increase in smoking-related research may be needed. It is likely that diabetes will become an increasing focus of intervention in the coming years due to the anticipated rise in prevalence. Similarly, as treatments for obesity become more effective a rise in studies to improve obesity management may also be expected.

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