

Knowledge base of successful implementation strategies for lifestyle issues in every day routine care practice



Edited by Myrna Keurhorst, Michaela Bitarello, Maud Heinen, Michel Wensing and Miranda Laurant



Edited by:

**Myrna Keurhorst, Michaela Bitarello, Maud Heinen, Michel Wensing and
Miranda Laurant**

2014

How to cite this book:

Keurhorst M, Bitarello do Amaral-Sabadini M, Heinen M, Wensing M & Laurant M eds. (2014). *Knowledge base of successful implementation strategies for lifestyle issues in every day routine care practice*. The ODHIN project. Nijmegen, the Netherlands.



CONTENTS

Acknowledgements

About the authors and editors

Chapter 1. Introduction and methods..... 6

Chapter 2. Successful implementation strategies for lifestyle issues in every day routine care practice 9

Chapter 3. Conclusions and reflective thoughts 30

Appendices 32

References 34

ACKNOWLEDGEMENTS

The research leading to these results or outcomes has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 259268 – Optimizing delivery of health care intervention (ODHIN). Participant organisations in ODHIN can be seen at: www.odhinproject.eu. Radboud university medical center received co-funding from The Netherlands Organisation for Health Research and Development (ZonMW, Prevention Program), under Grant Agreement n^o 200310017 – ODHIN – Optimizing delivery of healthcare interventions in the Netherlands, according Art.II.17 of the FP7 EC Grant Agreement.

The contents of each chapter are solely the responsibility of the corresponding authors and do not necessarily represent the official views of the European Commission or of the editors.

This document was edited by Myrna Keurhorst, Michaela Bitarello, Maud Heinen, Michel Wensing and Miranda Laurant. The editors would like to thank all the authors for contributing to the ebook.

In addition, the editors would like to extend their thanks to all the following people from the ODHIN project for their contribution this ebook: Peter Anderson, Irene van de Glind, Dorothy Newbury-Birch, Eileen Kaner and Jozé Braspenning.

The editors would like to thank Anna Artigas, Fleur Braddick and Jillian Reynolds for revisions, proof reading, design and formatting of the ebook.

ABOUT THE AUTHORS AND EDITORS

Peter Anderson, MD PhD

Professor, Substance Use, Policy and Practice, Institute of Health and Society, Newcastle University, United Kingdom
Professor, Alcohol and Health, Faculty of Health, Medicine and Life Sciences, Maastricht University, Netherlands

Michaela Bitarello, PhD

Independent consultant in public health, Brazil.

Jozé Braspenning, PhD

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Irene van de Glind, MSc

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Maud Heinen, PhD

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Eileen Kaner, PhD

Institute of Health and Society, Newcastle University, United Kingdom

Myrna Keurhorst, MSc

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Miranda Laurant, PhD

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Dorothy Newbury-Birch, PhD

Institute of Health and Society, Newcastle University, United Kingdom

Michel Wensing

Radboud university medical center, Radboud Institute for Health Sciences, IQ healthcare, Nijmegen, the Netherlands.

Chapter 1. INTRODUCTION AND METHODS

The last decades, non-communicable diseases increasingly contribute to global Disability Adjusted Life Years (DALYs). The global top 3 of DALYs are caused by are ischaemic heart disease, lower respiratory infections, and stroke, respectively, which all are non-communicable diseases [1]. Unhealthy life habits contribute to many non-communicable diseases (e.g. cardiovascular disease, diabetics, chronic lung diseases and cancers), which imply high disease burden as well as high use of healthcare [2, 3]. Mortality due to non-communicable diseases was mainly caused by cardiovascular diseases (48%), cancers (21%), chronic respiratory diseases (12%) and diabetes (3%) in 2008 [4]. These conditions are strongly linked with four behaviours: tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol [5]. In the past decades various effective lifestyle interventions have been developed to help patients and citizens to change unhealthy lifestyle habits. For example, brief interventions and nicotine replacement therapies have shown to be successful to stop smoking [6, 7]. Screening and brief interventions (SBI) for harmful and hazardous alcohol consumption also showed positive effects on alcohol consumption [8]. More recently e-health interventions (a broad category of tools and activities that use modern information technology) have proven to be effective [9]. The numbers needed to treat and the cost-effectiveness of lifestyle interventions seem promising [2, 10]. The next logical step is to implement these cost-effective interventions widely and sustainably, but this has proven to be a major challenge (e.g. [11-14]).

In order to build on, and substantially add to, previous studies on the implementation of lifestyle interventions, it is important to review the evidence base. Previous reviews of a range of different strategies have shown that a variety of implementation strategies result in small to moderate improvements [15-25]. Quality of care improvement requires specific implementation strategies aiming at reduction of barriers and gaining facilitators of high-quality of care [26]. Research identified a range of barriers to implement lifestyle interventions including insufficient knowledge and skills (18-20), absence of adequate reimbursement [26, 27] and lack of available healthcare workers to apply the interventions in daily practice [26, 28]. The current evidence base does not provide strong guidance to decision makers on the best approach to implementation of alcohol-related life style interventions.

Objectives

The focus of this ebook is to identify effective strategies to disseminate and implement SBI in primary care settings and to identify factors in the interventions and in the context in which these are applied, which foster or limit dissemination and implementation SBI in various health care settings. To do so, we conducted a review of reviews on the (cost-) effectiveness of professional educational and reimbursement strategies on lifestyle and prevention targeted at health professionals as well as the (cost-) effectiveness of e-health strategies on lifestyle and prevention targeted at patients/citizens.

Methods

Data sources and searches

This study comprises a systematic synthesis of reviews (a so called “review of reviews”) to gain up-to-date insight into the published evidence in the field of implementing prevention and lifestyle strategies. To do so, we conducted searches in Pubmed and the Cochrane Library from January 2006 till March 2012. The search was split up and combined into four sets by the Boolean operator AND:

Set 1: quality improvement; improvement; improving intervention(s); educational; e-learning; internet-based learning; ICT; information technology; financial; pay for performance; reimbursement; contracting; transparency

Set 2: systematic reviews; meta-analysis

Set 3: smoking; alcohol; exercise; diet

Set 4: prevention; health promotion

Furthermore suggestions of experts in the field of implementation research were assessed.

The search strings for both Pubmed and Cochrane Library are attached in section 2.4.

Study selection

Two reviewers (MK, ML) independently screened resulting citations based on title and abstract. Reviews were considered if they included studies from implementation strategies aimed at (qualified) health professionals and prevention workers and covered education; financial reimbursement or e-health singly or as part of multi-component implementation strategies. Included reviews could report on implementation strategies in all sectors of healthcare and public health. Furthermore, reviews of literature had to be based on a systematically literature search. Reviews were excluded if they didn't measure professional or patient outcomes in an empirical way or if they were narrative literature overviews.

Subsequently, the eligible reviews were obtained full text and independently assessed by two reviewers (MK, MB) using a data-extraction template (see appendix in section 2.4). Disagreements of inclusion were resolved by discussion with a third reviewer (ML).

In many papers the literature reviews contained quantitative evaluations with parallel control groups (randomized or not randomized). We assessed the quality of identified systematic reviews, but poor methodological quality of reviews was not an exclusion criterion.

Data extraction and narrative analysis

Identified reviews were prioritized by implementation strategy i.e. educational, financial reimbursement, e-health or multi-component studies including one of these strategies. E-health reviews were included in this review of reviews because they are considered as structural interventions in terms of changes to the setting/site of service delivery, or changes in physical structure, facilities and equipment.

From each eligible review, data were captured on first author, aim of the review, topic of the review, setting, patient group, implementation strategy (i.e. rationale and intensity of interventions), participants, number of studies included, results, conclusions of authors and applied process measures. Determinants of effects was the primary item for data collection. Subsequently quality of systematic reviews were assessed with the R-AMSTAR instrument for quality of reviews: a (revised) assessment tool for the quality of multiple systematic reviews [3]. This tool consists of 11 items, each with various criteria which have to be satisfied with a minimum score of 11 and maximum of 44 points. The instrument has good face and content validity for measuring the methodological quality of systematic reviews [3]. Also some risks of bias were included in this instrument.

Data synthesis and analysis

Included studies were assessed on a) general study characteristics; b) the method of reporting effectiveness, c) key findings and, if applicable, outcomes for which an effect and statistical significance could be calculated; d) effects for subgroups or subcomponents of reviewed implementation strategies outcomes and in the absence of an overall effect. Using a structured narrative analysis, we classified possible beneficial effects of implementation strategies into five categories of overall beneficial effect, ranging from ‘– –’ to a ‘++’ score, based on the strengths of effect. The reviews containing quantitative outcome measures were given higher weight in final conclusions.

To give in-depth insight in effective implementation strategies, we also identified effective elements of implementation interventions such as location of education, group size with education, financial reimbursement system, etc. In addition, to give an insight into the way implementation strategies are being undertaken and organised in order to stimulate prevention and health promotion of lifestyle activities, also important process measures such as attitudes, costs of implementation, etc. were described besides the provider and patient outcomes.

We present findings of effectiveness for each of the above described implementation strategies. We based our way of reporting on guidelines as described by the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses; formerly QOURUM statement [29, 30]).

Chapter 2. SUCCESSFUL IMPLEMENTATION STRATEGIES FOR LIFESTYLE ISSUES IN EVERY DAY ROUTINE CARE PRACTICE

The search strategy resulted in 404 unduplicated citations of reviews, which were screened on the basis of title and abstract. 62 reviews seemed to fulfill the inclusion criteria and were obtained full text for further inclusion. Subsequently 5 reviews did not include our implementation strategies of interest and were also excluded. In the end, 44 reviews were included for this review of reviews, accounting for 747 individual studies. The flow chart of study inclusion is shown in figure 1. Characteristics of the included reviews are shown in table 1. Where hampering or facilitating factors for implementation were found, they were described.

Professional education strategies

Review characteristics

There were nine reviews that included studies focusing on implementation of improving lifestyle behaviours. These ten reviews accounted for 226 included studies of which 219 unique studies. In the educational oriented reviews, three meta-analyses were carried out. All reviews were targeted at educating health professionals. After scoring the R-AMSTAR instrument, the mean methodological quality of all reviews was 30, with a range of 20 to 37 points. Included educational focused reviews were published between 2006 and 2011. Five reviews did not have language restrictions or publication restrictions. The number of included studies varied broadly from one to 81 studies. Moreover, design of included studies varied from exclusively included RCT's [15, 24, 31] to exclusively included before-and-after designs [32]. With respect to reported outcome measures, six reviews intended to report patient outcomes and all nine reviews intended to report outcomes of health professionals. Furthermore six reviews also intended to report process outcomes and only one review intended to include cost outcomes but failed. Lastly, one review was specifically focused on breast feeding and one review specifically focused on alcohol prevention; other reviews had no specific disease focus.

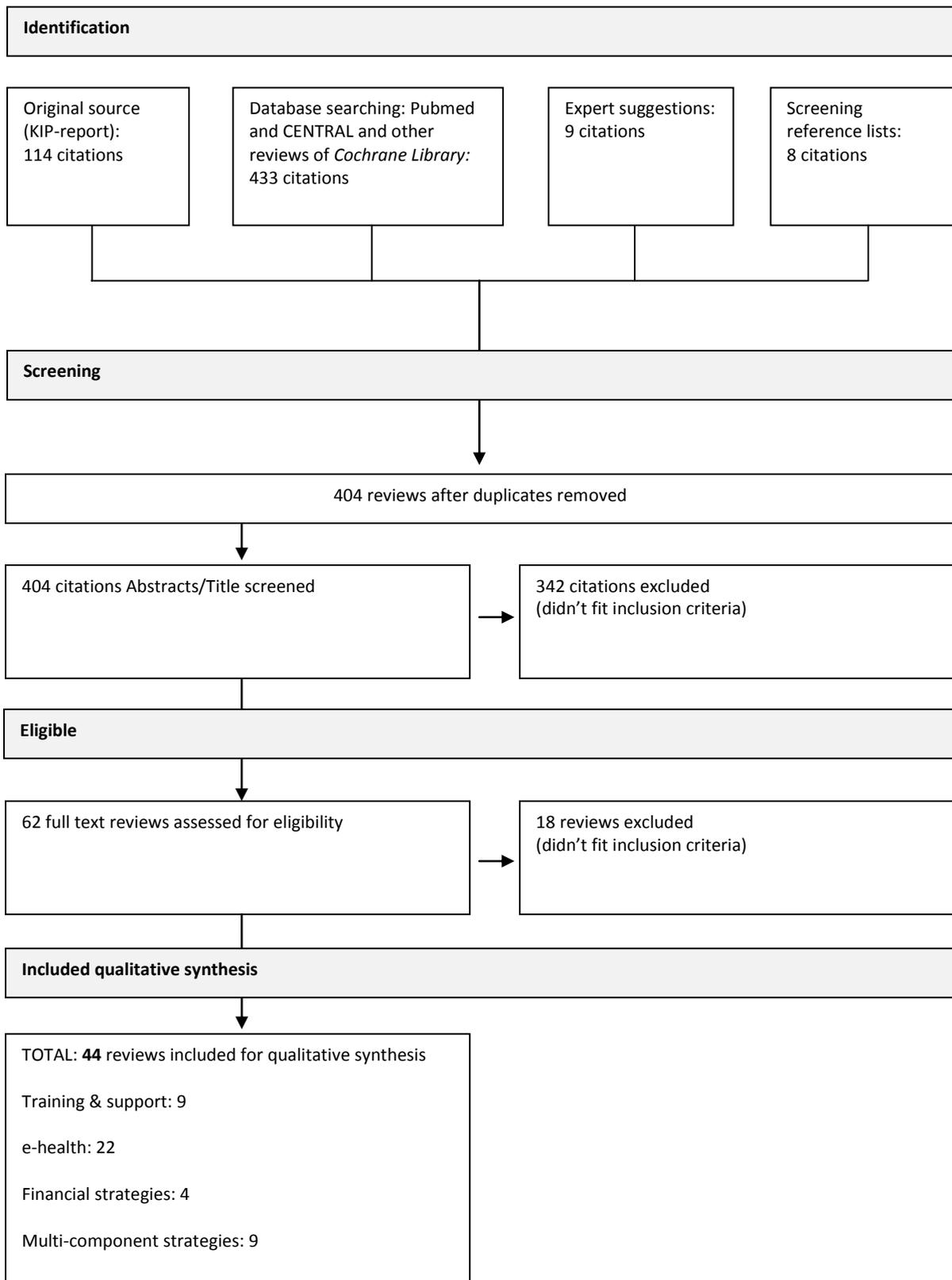
Effectiveness

The effectiveness of educational strategies varied, but were primarily supporting a positive effect of this type of implementation strategy (6 studies). Three studies had mixed effects of educational implementation strategies.

With regard to effective elements, effective education activities mainly were located in practice settings and peer trainers delivered the education. Furthermore a stepwise problem solving strategy seemed to be an effective and therewith important element of effective educational activities.

We attempted to identify most optimal intensity of education, however, if reported, the reviews included a wide range of applied intensities for different topics. The intensity ranged from just 1 session [33] to weekly visits for 12 months [24], and from 20 minutes per session [33] to 3 days [32].

Fig. 1: Study eligibility flow chart



Financial strategies

Review characteristics

The financial category included four reviews accounting for 37 individual studies. This category had the lowest number of reviews included and no meta-analyses were carried out. All reviews in this category were targeted at health professionals. The R-AMSTAR score was on average 30, ranging from 24 to 35. The included reviews were published in 2007, 2009, 2011 and 2012. Three reviews had a broad focused search strategy including no language restriction. Just one also did not have a publication restriction. The number of included studies were consistent, ranging from seven to 13 studies per review. Different kinds of designs were included: RCT's, CBA's, and ITS. The reviews also were consistent in their reported outcome measures. All reviews reported provider-related outcomes, three reported patient outcomes and two reported process outcomes. Two reviews reported about costs of the intervention, the other two intended but did not report after all.

Furthermore, all reviews had general target subjects of their intervention: pay for performance, financial incentives or pharmaceutical policies not specifically disease targeted.

Effectiveness

Three of the financial oriented reviews showed mixed results and one review had not studies of target base payment included and had therefore no applicable effect. The reviews hugely varied in terms of payment characteristics: stand-alone system (i.e. project-based), regionally or nationally based; both absolute and relative payment systems were described; and both primary and secondary care were included. However, it was not possible to extract effective elements due to lack of evidence. We neither could say it is effective, nor ineffective.

Support for implementation of e-health

Review characteristics

We found 22 reviews describing e-health interventions. Together they included 437 studies with 87 duplicates, resulting in 350 individual studies. Most of these reviews described patient outcomes, just some also included provider and process outcomes. The category of e-health had the lowest average quality score among the categories of this review: 27 with a range of 14 to 39. As e-health is relatively new in the field, all reviews were fairly recently published. The focus of included reviews regarding language and publication restrictions were on average equally distributed. All reviews also varied greatly in the number of included studies- ranging from 2 to 85 included studies which includes all kinds of designs. Subjects of reviews were very divergent. For example: coronary heart disease [34], sexual health promotion [35] and substance abuse [36-42]. Furthermore, reviews were focused at healthcare setting interventions as well as general population interventions. Costs were reported in three reviews.

Effectiveness

The majority of e-health oriented reviews showed positive or strong positive effects (13 studies), although nine studies yet show mixed effects. Reviews primarily described whether the e-health interventions were effective, there was a minimal focus on effective elements of the interventions. However, it still seems that effective e-health interventions are interactive and incorporate for example feedback opportunities. This is relates to another effective element, which is that tailoring to users' health behaviour is significant. Ways to tailor are personalised web pages and adopting to the stage of change of the e-health user. Lastly, motivational interventions seemed to be effective.

Multi-component implementation

Review characteristics

The category of multi-component interventions accounted for 9 included reviews. These reviews included in total 162 studies with 18 duplicate studies between reviews, resulting in 144 unique studies. Most studies provided patient and provider outcomes, and just some also reported process measures. The multi-component oriented reviews had the highest R-AMSTAR quality score of 30, ranging from 25 to 38. Dates of publishing differed from 2002 to 2010 and had very different kinds of research designs. Almost half of the included reviews had a narrow focus concerning language and publication restrictions. Others had broader foci, for example no language restrictions in the search strategy. The number of studies included did not vary greatly; ranging from four to 33 included studies. In just two reviews the included studies were appropriate to pool. Furthermore, different kinds of subjects were focused on. General as well as very theme-specific, e.g. reducing caesarean section rates. Lastly, just two reviews also reported on cost data.

Effectiveness

Most included reviews (7 studies) supported a positive effect of multi-component implementation strategies, just two concluded mixed effects. Within the reviews that included more types of implementation strategies, numbers of components are used in delivering interventions. One element was assessed as not effective (as stand alone), which is the passive dissemination of guidelines. On the other hand, number of other elements were effective: audit and feedback, outreach visits or education or continuing medical education, reminders, local consensus procedures or opinion leaders, multidisciplinary teams, financial interventions and organisational interventions. Moreover, tailoring to the implementation barriers identified, is a relative very effective part of multi-component interventions. It is important to note that these elements all were part of multi-component implementation strategies. Therefore it could not be said that the elements were effective on stand alone.

Furthermore we notice that within multi-component reviews, elements are identified as effective, while they were not effective as stand alone interventions. For example, within the category of financial oriented interventions, there were strong mixed results. When combined with other kinds of implementation strategies, they might be effective.

Table 1 Characteristics of reviews

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Educational oriented implementation strategies						
Akl et al 2008[31]	35	1 study: 1 RCT	All settings; the effect of educational games on health professionals' performance, knowledge, skills, attitude and satisfaction, and on patient outcomes; educational games	Qualitative reporting	<i>Patient outcomes:</i> Statistically significant difference in main effect of knowledge retention (delayed post-test score) in the gaming reinforcement group compared with the control group (p=0.02). Significant interaction effect between gaming reinforcement and type of instruction suggesting that in the group of patients exposed to the videotape, gaming reinforcement was associated with a statistically higher score than the control group (mean = 16.6 versus mean = 15.5) whereas in patients exposed to the self learning module, gaming reinforcement was not associated with a statistically higher score (mean = 17.0 versus 16.9).	+/-
Farmer et al 2008[43]	33	23 studies: 12 RCT's, 1 CBA, 10 ITS	All; effectiveness of printed educational materials (PEMs)	Quantitative Risk Differences reported, but no formal meta-analysis	<i>Patient outcomes:</i> median effect size of -4.3% for patient outcome categorical measures (e.g., screening, return to work, quit smoking) (range -0.4% to -4.6%, 3 studies)). Two studies reported deteriorations in continuous patient outcome data (e.g., depression score, smoking cessation attempts) of -10.0% and -20.5%. <i>Process outcomes:</i> <i>RCTs:</i> +4.3% on categorical process outcomes (e.g., x-ray requests, prescribing and smoking cessation activities) (range -8.0%to +9.6%, 6 studies), and a relative risk difference +13.6% on continuous process outcomes (e.g., medication change, x-rays requests per practice) (range -5.0% to +26.6%, 4 studies) <i>ITS:</i> significant effect sizes (relative risk difference range from 0.07% to 31%) <i>Effective elements:</i> uncertain	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Forsetlund et al 2008[15]	37	81 studies: 81 RCT's	Primary and secondary care; To assess the effects of educational meetings on professional practice and healthcare outcomes; educational meetings	Meta-analysis (expressed median adjusted RD with interquartile range; and percentage change from intervention relative to control group)	<p><i>Intensity:</i> range of 1-12 series of PEM in interventions. No conclusion of review regarding optimal intensity.</p> <p><i>No information about group size, or trainers reported</i></p> <p><i>Provider outcomes:</i> Based on 30 trials the median adjusted RD in compliance with desired practice was 6% (interquartile range 1.8 to 15.9) when any intervention in which educational meetings were a component was compared to no intervention. Educational meetings alone had similar effects (median adjusted RD 6%, interquartile range 2.9 to 15.3; based on 21 comparisons in 19 trials).</p> <p><i>Patient outcomes:</i> For patient outcomes the median adjusted RD in achievement of treatment goals was 3.0 (interquartile range 0.1 to 4.0; 5 trials).</p>	+
Mansouri et al 2009[44]	28	6 studies: 6 trials	Primary health care; effect of education on attitude and knowledge of mental health care providers and citizens of Iran	Meta-analysis (expressed standardized mean differences)	<p><i>Provider outcomes:</i> some evidence for the efficacy of training on improvement of attitude and knowledge of the health personnel both in short and long term in PHC system</p> <p><i>Patient outcomes:</i> a meta-analysis of 2 studies showed that the training had an overall significant effect on improving the attitude of the citizens after two years ($Z = 1.96$, $p = 0.05$, effect size = 0.22, 95% CI = 0.0–0.44).</p> <p><i>Effective elements:</i> uncertain</p> <p><i>Intensity:</i> not reported</p> <p><i>Information about group size, location, or trainers not reported</i></p>	+
Nilsen et al 2006[45]	20	11 studies: 5 RCT's , 3 CBA, 2 ITS	Primary health care; implementation of brief alcohol interventions in primary healthcare in order to determine the effectiveness of the implementation efforts by the health care providers; training and support	Qualitative reporting	<p><i>Professional outcomes:</i> Intervention effectiveness (material utilization, screening, and brief intervention rates) generally increased with the intensity of the intervention effort, i.e. the amount of training and/or support provided. Nevertheless, the overall effectiveness was rather</p>	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
O'Brien et al 2007[24]	30	69 studies: 69 RCT's	All; educational outreach visits (EOV's)	Meta-regression (expressed median adjusted RD)	<p>modest.</p> <p><i>Process outcomes:</i> see above</p> <p><i>Effective elements:</i> uncertain</p> <p><i>Intensity:</i> 30 minutes – 2 hours</p> <p><i>Group sizes:</i> uncertain. Intervention groups varied 22 physicians-172 physicians</p> <p><i>Locations:</i> outreach, as well as in the practice</p> <p><i>Trainers:</i> not reported</p> <p><i>Provider outcomes:</i> The median adjusted risk difference (RD) in compliance with desired practice was 5.6% (interquartile range 3.0% to 9.0%).</p> <p><i>Effective elements:</i> details of intensity remains unclear, but more positive effects for locating in practice setting</p> <p><i>Intensity:</i> varied from once to weekly visits for 12 months</p> <p><i>Location:</i> in practice setting</p> <p><i>Trainers:</i> peers (GPs) recommended</p>	+
Ross et al 2009[46]	30	15 studies: 6 RCT's, 4 before-and-after, 5 CCT's	Primary and secondary care setting; educational interventions to improve prescribing by medical students and junior doctors	Qualitative reporting	<p><i>Provider outcomes:</i> There is only moderate evidence in the literature to inform medical schools about how to prepare medical students for the challenges of prescribing</p> <p><i>Effective elements:</i> 1) structured problem solving; 2) problem-solving intervention; 3) six-step process; and 4) simulated scenarios</p> <p><i>Intensity:</i> varied from 1 to 5 sessions, with a range from 20 min- 30 minutes (but most unknown)</p> <p><i>Location:</i> 2 trials reported in-house</p> <p><i>No information about group size or trainers reported</i></p>	-/+
Söderlund et al 2011[33]	26	10 studies: 3RCT's, 2 CBA, 5 ITS	General health care; motivational interviewing (MI) training for general health care professionals.	Qualitative reporting	<p><i>Provider outcomes:</i> The training generated positive outcomes overall and had a significant effect on many aspects of the participants' daily practice, but the results must be interpreted with caution due to the inconsistent study quality.</p>	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Spiby et al 2009[32]	27	9 studies: 9 before-after studies	All; the effects of training, education and practice change interventions with health professionals and lay breast feeding educator/counsellors on duration of breast feeding	Qualitative reporting	<p><i>Process outcomes:</i> Although the studies examined heterogeneous outcomes, the participants' reactions were generally favourable.</p> <p><i>Effective elements:</i> uncertain</p> <p><i>Intensity:</i> Training duration ranged from 20 minutes to 24 hours. The median length was approximately 9 h, that is, slightly more than 1 day. Three studies investigated MI training lasting 4 h or less; four studies examined training efforts that lasted 16 h or more. Frequency ranged from 1 to 5 session (regardless of duration per session).</p> <p><i>Trainers:</i> Motivational Interviewing trainers</p> <p><i>Group sizes and location not reported</i></p> <p><i>Patient outcomes:</i> In four studies it was observed an statistically significant increase in the proportion of women continuing breast after the intervention, but only a short term. In the remaining studies there was a positive trend. There seems to be no single way that consistently achieves changes in breast feeding duration.</p> <p><i>Process outcomes:</i> Including attitude, knowledge and behaviour change among health-care professionals, women's views and costs of the intervention. Outcomes barely reported</p> <p><i>Effective elements:</i> uncertain</p> <p><i>Intensity:</i> varied from 45 minutes (training sessions) to 3 days seminar</p> <p><i>Location of intervention:</i> combining hospital-based and community-based training</p> <p><i>Trainers:</i> educators or counselors</p> <p><i>Group size not reported</i></p>	-/+
Financial oriented implementation strategies						
Mehrotra et al 2009[47]	24	8 studies (designs unknown)	Hospital; effect of P4P on clinical process measures, patient outcomes and experience, safety, and resource utilization	Qualitative reporting	<p><i>Provider outcomes:</i> reported outcomes of papers lacked.</p> <p><i>Patient outcomes:</i> The most rigorous studies focus on clinical process measures and demonstrate</p>	-/+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Scott et al 2011[48]	35	7 studies: 3 c-RCT, 2 CBA's, 1 controlled ITS, 1 ITS	Primary health care; effect of changes in the method and level of payment on the quality of care provided by primary care physicians	Qualitative reporting	<p>that hospitals participating in the Centers for Medicare and Medicaid Services-Premier Hospital Quality Incentive Demonstration, a P4P program, had a 2- to 4-percentage point greater improvement than the improvement observed in control hospitals.</p> <p><i>Process outcomes:</i> reported outcomes of papers lacked.</p> <p><i>Effective elements:</i> uncertain</p> <p><i>Provider and patient outcomes:</i> Six of the seven studies showed positive but modest effects on quality of care for some primary outcome measures, but not all. One study found no effect on quality of care. Insufficient evidence to support or not support the use.</p>	-/+
Sturm et al 2007[49]	34	13 studies: 3 CITS, 3 ITS, 9 CBA	All; the effects on drug use, healthcare utilisation, health outcomes and costs (expenditures) of policies, that intend to affect prescribers by means of financial incentives	Qualitative reporting	No studies of target based payment included, only these are of relevance for this reviews	NA
Witter et al 2012[50]	27	9 studies: 1RCT, 6 CBA, 2 ITS	All; effects of paying for performance on the provision of health care and health outcomes in low and middle-income countries	Qualitative reporting	<p><i>Provider and patient outcomes:</i> Of the four outcome measures, two showed significant improvement for the intervention group (wasting and self reported health by parents of the under-fives), while two showed no significant difference (being C-reactive protein (CRP)-negative and not anaemic). The two more robust studies both found mixed results - gains for some indicators but no improvement for others</p> <p><i>Process outcomes:</i> Only 2 studies reported on unintended effects - in both studies the authors voiced concerns about the curative nature of the coverage targets and whether this may squeeze out preventive care. However, no conclusive evidence was found to support or refute this.</p> <p>Patient and provider satisfaction: The view from</p>	-/+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
					patients is mixed. Staff were mainly critical about the financial interventions. Costs: The range of investment was from USD 0.5 per capita in Tanzania and Zambia to USD 2.6 per capita in Burundi	
E-health oriented implementation strategies						
Bailey et al 2010[35]	36	15 studies: 15 RCT's	Effects of interactive computer-based interventions (ICBI) for sexual health promotion Both patient and cluster randomized trials included	Meta-analysis with standardized mean differences (SMDs) for continuous outcomes and odds ratios (ORs) for binary outcomes	<i>Patient outcomes:</i> Comparing ICBI to 'minimal interventions' such as usual practice, meta-analyses showed statistically significant effects as follows: moderate effect on sexual health knowledge (SMD 0.72, 95% CI 0.27 to 1.18); small effect on safer sex self-efficacy (SMD 0.17, 95% CI 0.05 to 0.29); small effect on safer-sex intentions (SMD 0.16, 95% CI 0.02 to 0.30); and also an effect on sexual behaviour (OR 1.75, 95% CI 1.18 to 2.59). Data were insufficient for meta-analysis of biological outcomes and analysis of cost-effectiveness	+
Beranova et al 2007[34]	23	5 studies: 5 RCT and comparison studies, distribution of designs not reported	To evaluate the use of computer-based softwares for educating patients with coronary heart disease Assumed to be patient-randomized	Qualitative reporting	<i>Patient outcomes:</i> There is strong evidence that the use of computer-based educational software improves knowledge in patients with coronary heart disease in the short term <i>Process outcomes:</i> Patients reported high satisfaction with the educational programs. Patients in the intervention groups were more empowered	++
Bewick et al 2008[36]	29	10 studies: 1 RCT, 4 randomized trials, 1 controlled study, 1 cohort study, 3 descriptive studies	Effectiveness of web-based interventions designed to decrease consumption of alcohol and/ or prevent alcohol abuse Assumed to be patient-randomized	Qualitative reporting	<i>Patient outcomes:</i> AUDIT: mean effect size d between groups control- intervention of 0.62 (significant) (favours comparison). Effects on unit quantity: mean effect size d between groups control- intervention of 0.03 (ns); 0.55 (ns); and -0.12 (not sign) (favours comparison); Effects on frequency of heavy drinking: 0.04 (ns); -0.29 (ns). Effects on maximum consumption per day: -0.09 (ns); 0.20 (ns) <i>Process outcomes:</i> process feedback provided was	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Car et al 2010[51]	36	2 studies: 1 RCT, 1 CBA	Effects of interventions for enhancing consumers' online health literacy (skills to search, evaluate and use online health information). Both patient and cluster randomized trials included	Qualitative reporting	positive in terms of the usefulness of the site: 57% of participants reported that the websites were interesting, 61% accurate in feedback, 80% helpful and 20%–56% useful. At least three quarters of participants also reported finding the sites easy to use. In addition, a small but notable percentage (3%–8%) of participants reported that they felt that the information would change their alcohol habits for the better. <i>Patient outcomes:</i> two studies included and only the RCT reported statistically significant effects for primary outcomes related to online health literacy in the intervention group. Those concerned 'Self-efficacy for health information seeking', 'health information evaluation skills' and the 'number of times the patient discussed online information with a health provider. The CBA reported no significant changes. The evidence is too weak to draw any conclusions about implications for the design and delivery of interventions for online health literacy.	-/+
Carey et al 2009[37]	29	35 studies; 43 separate interventions (all pre-post test)	Efficacy of computer-delivered interventions (CDIs) to reduce alcohol use among college students Assumed to be patient-randomized	Meta-analysis with effect sizes (<i>d</i>) as between-group and within-group differences	<i>Patient outcomes:</i> CDIs are associated with improvement over time, and produce greater risk reduction than no intervention. Relative to assessment-only controls, CDIs reduced both quantity and frequency measures of consumption; the observed effects are small (0.09–0.28) over short- and long-term intervals	+
Civiljak et al 2010[52]	36	20 studies: all RCT's or quasi-RCT's	The effectiveness of Internet-based interventions for smoking cessation Both patient and cluster randomized trials included	Qualitative reporting	<i>Patient outcomes:</i> Results suggest that some Internet-based interventions can assist smoking cessation, especially if the information is appropriately tailored to the users and frequent automated contacts with the users are ensured, however trials did not show consistent effects <i>Process outcomes:</i> With regard to satisfaction of users, interactive sites reported benefits.	-/+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Currell et al 2010[53]	35	7 studies: 7 RCT's	Effectiveness of telemedicine as an alternative to face to face patient care Both patient and cluster randomized trials included	Qualitative reporting	<i>Patient outcomes:</i> Although none of the studies showed any detrimental effects from the interventions, neither did they show unequivocal benefits and the findings did not constitute evidence of the safety of telemedicine <i>Process outcomes:</i> All the technological aspects of the interventions appear to have been reliable, and to have been well accepted by patients.	-/+
Garcia-Lizana et al 2007[54]	24	24 studies: 24 RCT's	Clinical effectiveness of interventions using information and communication technologies for managing and controlling chronic diseases Assumed to be patient-randomized	Qualitative reporting	<i>Patient outcomes:</i> Most of the reports evaluated did not show significant changes in clinical outcomes or quality of life. Studies with most relevant outcomes achieved in clinical variables were interventions in hypertension and heart failure. Although there was a tendency towards improved indicators, the results were not significant. None of the papers included in the review identified any adverse or negative effects on health or quality of life indicators. <i>Process outcomes:</i> When satisfaction was explored it showed that both professionals and patients demonstrated satisfaction with the new technologies	-/+
Harris et al 2011[55]	38	43 studies: 43 RCT's	Effectiveness and cost-effectiveness of adaptive e-learning for improving dietary behaviours Both patient and cluster randomized trials included	Meta-analysis with WMD	<i>Patient outcomes:</i> E-learning interventions were associated with a WMD of +0.24 (95% CI 0.04 to 0.44) servings of fruit and vegetables per day; -0.78 g (95% CI -2.5 g to 0.95 g) total fat consumed per day; -0.24 g (95% CI -1.44 g to 0.96 g) saturated fat intake per day; -1.4% (95% CI -2.5% to -0.3%) of total energy consumed from fat per day; +1.45 g (95% CI -0.02 g to 2.92 g) dietary fibre per day; +4 kcal (95% CI -85 kcal to 93 kcal) daily energy intake; -0.1 kg/m ² (95% CI -0.7 kg/m ² to 0.4 kg/m ²) change in body mass index. <i>Costs:</i> The incremental cost effectiveness ratio was approximately £102,112 per quality-adjusted life-year (QALY). Although the individual level EVPI	++

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Lustria et al 2009[56]	22	30 studies: 30 RCT's	To explore how computer-tailored, behavioural interventions implemented and delivered via the Web have been operationalised in a variety of settings Both patient and cluster randomized trials included	Qualitative reporting	was arguably negligible, the population-level value was between £37M and £170M at a willingness to pay of £20,000–30,000 per additional QALY. <i>Patient outcomes:</i> The level of sophistication of these interventions varied from immediate risk/health assessment, tailored web content to full-blown customized health programs. The most common variables for tailoring content were health behaviours and stages of change. Message tailoring was achieved through a combination mechanisms including: feedback, personalization and adaptation	+
McLean et al 2010[57]	39	21 studies: 21 RCT's	The effectiveness of telehealthcare interventions in people with asthma Assumed to be patient-randomized	Meta-analysis with OR for dichotomous outcomes and MD for continuous outcomes	<i>Patient outcomes:</i> the included interventions did not improve asthma quality of life (minimum clinically important difference = 0.5): mean difference in Juniper's Asthma Quality of Life Questionnaire (AQLQ) 0.08 (95% CI 0.01 to 0.16). Telehealthcare for asthma resulted in a non-significant increase in the odds of emergency department visits over a 12-month period: OR 1.16 (95% CI 0.52 to 2.58). There was, however, a significant reduction in hospitalizations over a 12-month period: OR 0.21 (95% CI 0.07 to 0.61), the effect being most marked in people with more severe asthma managed predominantly in secondary care settings <i>Process outcomes:</i> study withdrawal - highly differed between studies. Time off school or work- 3 days per month, 10 days per year and 0.74 in six weeks. PEF monitoring and diary monitoring- telehealthcare improved PEF in some studies, but that this was not a consistent finding. Patient satisfaction- consistent findings that patient prefer telehealthcare above standard care.	-/+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Portnoy et al 2009[58]	24	75 studies: 75 RCT's; 82 separate interventions	Efficacy of computer-delivered interventions to promote healthy behaviour Both patient and cluster randomized trials included	Meta-analysis with effect sizes (<i>d</i>) as between-group differences	<i>Cost outcomes:</i> The authors mention that it overall appears that the studies which analyzed costs found that where hospitalization was prevented, costs were favourable to continuing the intervention. However, this did not hold true for all studies. <i>Patient outcomes:</i> Participants who received a computer-delivered intervention improved several hypothesized antecedents of health behaviour (knowledge, attitudes, intentions); intervention recipients also improved health behaviours (nutrition, tobacco use, substance use, safer sexual behaviour, binge/purge behaviours) and general health maintenance. Several sample, study and intervention characteristics moderated the psychosocial and behavioural outcomes	+
Reavly et al 2010[38]	17	Not reported	Evidence for prevention and early intervention in mental health problems in higher education students Both patient and cluster randomized trials included	Qualitative reporting	<i>Patient outcomes:</i> Regarding prevention or intervene for early for alcohol misuse, effectiveness evidence is strongest for brief motivational interventions and for personalized normative interventions delivered using computers or in individual face-to-face sessions. Few interventions to prevent or intervene early with depression or anxiety were identified. These were mostly face-to-face, cognitive-behavioural/skill-based interventions. One social marketing intervention to raise awareness of depression and treatments showed some evidence of Effectiveness. There is very limited evidence that interventions are effective in preventing or intervening early with depression and anxiety disorders in higher education students	+
Riper et al 2009[40]	31	14 studies: 14 RCT's	Effectiveness of brief, single-session personalized-feedback interventions without therapeutic guidance to reduce	Meta-analysis with effect sizes (<i>d</i>) as between-group	<i>Patient outcomes:</i> The pooled standardized-effect size (14 studies, 15 comparisons) for reduced alcohol consumption at post-intervention was	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Riper et al 2011[39]	33	9 studies: 9 RCT's	problem drinking Assumed: both patient and cluster randomized trials included Effectiveness of e-self-help Interventions for Curbing Adult Problem Drinking Patient-randomized trials included	differences Meta-analysis with overall medium effect size (<i>g</i>)	d=0.22 (95% CI=0.16, 0.29, p=0.00; the number needed to treat =8.06; areas under the curve=0.562). <i>Patient outcomes:</i> An overall medium effect size (<i>g</i> = 0.44, 95% CI 0.17-0.71, random effect model) was found for the 9 studies, all of which compared no-contact interventions to control conditions	+
Ryhanen et al 2010[59]	25	14 studies: 9 RCT's, 2 clinical trials, 3 quasi-experimental	Effectiveness of Internet or interactive computer-based patient education programs in the field of breast cancer patient education Assumed to be patient-randomized	Qualitative reporting	<i>Patient outcomes:</i> The review suggests a positive relationship between the Internet or computer-based patient education program use and the knowledge level of patients with breast cancer. Other effects were diverse	-/+
Tait et al 2010[41]	21	14 studies: 14 randomized trials (controlled not mentioned)	Effectiveness of web-based interventions for problematic substance use by adolescents and young adults Assumed to be patient-randomized	Meta-analysis with effect sizes (<i>d</i>) as between-group differences	<i>Patient outcomes:</i> The alcohol interventions had a small effect overall (<i>d</i> =- 0.22) and for specific outcomes (level of alcohol consumption, <i>d</i> =- 0.12; binge or heavy drinking frequency, <i>d</i> =- 0.35; alcohol-related social problems, <i>d</i> =- 0.57). The interventions were not effective (<i>d</i> =- 0.001) in preventing subsequent development of alcohol-related problems among people who were non-drinkers at baseline.	-/+
Tate et al 2009[60]	14	8 studies(designs not reported)	Cost effectiveness of Internet interventions Assumed to be patient-randomized	Qualitative reporting	Lack of cost data published to date, to draw conclusions	-/+
Verhoeven et al 2007[61]	26	39 studies: 11 RTC's, 19 observational, 6 quasi-experimental, other incidentally used designs	Benefits and deficiencies of teleconsultation and videoconferencing regarding clinical, behavioural, and care coordination outcomes of diabetes care Assumed to be patient-randomized	Qualitative reporting and pooled results, but no formal meta-analysis	<i>Patient outcomes including costs:</i> At clinical level, results from the six RCTs of the identified teleconsultation studies did not show a significant reduction in HbA(1c) (0.03%, 95% CI = - 0.31% to 0.24%) compared to usual care. The selected studies suggest that both teleconsultation and videoconferencing are practical, cost-effective, and reliable ways of	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Walters et al 2006[62]	18	19 studies: (designs not reported)	Effects of computer interventions on smoking cessation Both patient and cluster randomized trials included	Qualitative reporting	delivering a worthwhile health care service to diabetics. However, the diversity in study design and reported findings makes a strong conclusion premature <i>Patient outcomes:</i> While computer-based smoking prevention and cessation programs show promise in influencing tobacco-related behaviours, published studies show mixed results in terms of translating the educational experience to real-world practice. Of the 19 automated, computer-based interventions that were reviewed, nine (47%) showed evidence of effectiveness at the longest follow-up	-/+
Webb et al 2009[63]	23	85 studies (designs not reported)	Which characteristics of Internet-based interventions best promote health behaviour change and to develop a novel coding scheme for assessing mode of delivery in Internet-based interventions and also to link different modes to effect sizes.	Meta-analysis with effect sizes (<i>d</i>) as between-group differences	<i>Patient outcomes:</i> Interventions had a statistically small but significant effect on health-related behaviour ($d = 0.16$, 95% CI 0.09 to 0.23).	+
White et al 2010[42]	20	17 studies: 17 RCT's	Assumed to be patient-randomized Efficacy of online interventions for alcohol misuse Both patient and cluster randomized trials included	Qualitative reporting	<i>Patient outcomes:</i> differential effect sizes to posttreatment ranged from 0.02 to 0.81 (median 0.54). Using the full samples of participant, the mean differential effect size was 0.42. If only identified problem drinkers are included (rather than the full sample dataset), the effect size rose to 0.47. The pre-post differential effect size for brief personalized (normative) feedback programs ranged from 0.02 to 0.81 (mean 0.39, mean 0.33). And for the multi-session modularized programs a pre-post differential effect size of 0.56 was obtained in each case. Pre-post differential effect sizes for peak blood alcohol concentrations (BAC) ranged from 0.22 to 0.88, with a mean effect size	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
						of 0.66.
Multi-component oriented implementation strategies						
Aboelela et al 2007[64]	27	33 studies: 30 non-randomized clinical trial (pre-post comparison), 3 non-randomized interventions (different unit comparison)	Hospital: acute care/intensive care unit; Effectiveness of interventions aimed at changing healthcare workers' behaviour in reducing healthcare-associated infections (HAI)	Qualitative reporting	<i>Patient and provider outcomes:</i> 4 studies reported significant reductions in HAI or colonization rates. These studies used educational programs, multi-disciplinary quality improvement team, compliance monitoring and feedback and a mandate to sign a hand hygiene requirement statement. In all 33 studies, bundles of 2-5 interventions were employed, making it difficult to determine the effectiveness of individual interventions. <i>Process outcomes:</i> not reported	+
Akbari et al 2008[65]	33	17 studies: 10 RCT's, 5 CBA's, 1 CCT, 1 ITS	Primary care; Effectiveness and efficiency of interventions to change outpatient referral rates or improve outpatient referral appropriateness	Qualitative reporting	<i>Patient and provider outcomes:</i> Effective strategies: - dissemination of guidelines with structured referral sheets; - involvement of consultants in educational activities - organisational interventions - financial interventions <i>Ineffective strategies:</i> - passive dissemination of local referral guidelines - feedback of referral rates - discussion with an independent medical adviser <i>Moderate:</i> - fund holding scheme <i>Process outcomes:</i> not reported	+
Chaillet et al 2006[66]	29	33 studies: 10 Cluster-RCT's, 6 RCT's, 1 CBA, 16 ITS note: result table includes only 32 citations	To estimate effective strategies for implementing clinical practice guidelines in obstetric care and to identify specific barriers to behaviour change and facilitators in obstetrics	Qualitative reporting	<i>Patient and provider outcomes:</i> Educational strategies with medical providers are generally ineffective; Educational strategies with paramedical providers, opinion leaders, qualitative improvement, and academic detailing have mixed effects; Audit and feedback, reminders, and multi-component strategies are generally effective. The proportion of successful	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Chaillet et al 2007[67]	31	10 studies: 2 Cluster-RCT's, 3 RTC's, 5 ITS	Assumed to be in the hospital; Effectiveness of interventions for reducing the cesarean section rate and to assess the impact of this reduction on maternal and perinatal mortality and morbidity	Meta-analysis with relative risk as measures of effect size	<p>strategies is significantly higher among those interventions that include an identification of barriers to change compared with other interventions (93.8% versus 47.1%, n=33, P=.004).</p> <p><i>Process outcomes:</i> not reported</p> <p><i>Patient outcomes:</i> Significant reduction of caesarean section rates (pooled RR, 0.81; 95% CI, 0.75–0.87; p < 0.00001). Audit and feedback (pooled RR = 0.87 [0.81, 0.93]), quality improvement (pooled RR=0.74 [0.70, 0.77]), and multi-component strategies (pooled RR=0.73 [0.68, 0.79]) were effective for reducing the caesarean section rate. Quality improvement based on active management of labour showed mixed effects. Studies including an identification of barriers to change were more effective than other interventions for reducing the caesarean section rate (pooled RR=0.74 [0.71, 0.78] vs 0.88 [0.82, 0.94]). Among included studies, no significant differences were found for perinatal and neonatal mortality and perinatal and maternal morbidity with respect to the mode of delivery. Only 1 study showed a significant reduction of neonatal and perinatal mortality (p<0.001).</p> <p><i>Process outcomes:</i> not reported</p> <p><i>Patient outcomes:</i> Educational interventions aimed at GPs, compared to standard care, could reduce the average weight of patients after a year (by 1.2 kg, 95% CI -0.4 to 2.8 kg). Reminders (1 trial) could change doctors' practice concerning men (by 11.2 kg, 95% CI 1.7 to 20.7 kg) but not women (who reduced weight by 1.3 kg, 95% CI -4.1 to 6.7 kg). Patients may lose more weight after a year if the care was provided by a dietician</p>	+
Flodgren et al 2010[68]	35	6 studies: 6 RCT's	Healthcare organisations, defined as organisations that had health care as their primary objective. All patients in an included study had to be recruited in the context of a healthcare setting; Effectiveness of strategies to change the behaviour of health professionals and the organisation of care to promote weight reduction in overweight and obese people	Meta-analysis with mean differences as measures of effect size	<p><i>Process outcomes:</i> not reported</p> <p><i>Patient outcomes:</i> Educational interventions aimed at GPs, compared to standard care, could reduce the average weight of patients after a year (by 1.2 kg, 95% CI -0.4 to 2.8 kg). Reminders (1 trial) could change doctors' practice concerning men (by 11.2 kg, 95% CI 1.7 to 20.7 kg) but not women (who reduced weight by 1.3 kg, 95% CI -4.1 to 6.7 kg). Patients may lose more weight after a year if the care was provided by a dietician</p>	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Gould et al 2010[69]	38	4 studies: 1 RCT, 1 CBA, 2 ITS	Hospital or community setting; success of strategies to improve hand hygiene compliance and to determine whether a sustained increase in hand hygiene compliance can reduce rates of health care-associated infection.	Qualitative reporting	(by 5.6 kg, 95% CI 4.8 to 6.4 kg) or by a doctor-dieticians team (by 6 kg, 95% CI 5 to 7 kg), as compared with standard care (one trial). <i>Process outcomes:</i> not reported <i>Patient outcomes:</i> Hand hygiene compliance increased for one of the studies where it was measured by direct observation, but the results from the other study were not conclusive. <i>Provider outcomes:</i> One of the education campaigns found an increase in hand hygiene while the other did not. The simple substitutions were not associated with an increase in product use. The campaigns based on the Swiss model showed an increase in product use in two of the three units where applied. Product use also increased in the units with the social marketing campaign and the campaign with staff involvement. <i>Process outcomes:</i> not reported	-/+
Harvey et al 2002[70]	27	18 studies: 16 RCT's, 1 CBA, 2 CCT	Assumed all settings; Existence and effectiveness of interventions to improve health professionals' management of obesity or the organisation of care for overweight and obese people	Qualitative reporting	There are few solid leads about improving obesity management, although reminder systems, brief training interventions, shared care, inpatient care and dietician-led treatments may all be worth further investigation. <i>Process outcomes:</i> satisfaction with provider practice or health care provision; patient behaviour (attendance levels at weight management or physical exercise programmes). None of the included studies reported.	-/+
Kastner et al 2008[71]	29	13 studies: 13 RCT's	Assumed to be in the hospital; Effectiveness of tools that support clinical decision making in osteoporosis disease management	Qualitative reporting	<i>Patient outcomes:</i> Reminders plus education targeted to physicians and patients: increased BMD testing (RR range 1.43 to 8.67) and osteoporosis medication use (RR range 1.60 to 8.67). Physician reminder plus a patient risk assessment strategy: reduced fractures [RR 0.58, 95% confidence interval (CI) 0.37 to 0.90] and	+

Reference	R-AMSTAR score*	Number of studies	Study setting; Outcomes;	Data- synthesis/ report of findings	Key findings	Overall effect rating
Ostini et al 2009[72]	25	29 studies: 21 RCT's, 4 CBA's, 1 ITS, 3 CCT's	Community settings; evidence about strategies that are likely to encourage the adoption of appropriate, safe, and cost-effective prescribing	Qualitative reporting	<p>increased osteoporosis therapy (RR 2.44, CI 1.43 to 4.17). Compared to control, multi-component intervention increased BMD testing (RR 1.43, CI 1.11 to 1.86) and osteoporosis medication use (RR 1.60, CI 1.07 to 2.41)</p> <p><i>Process outcomes:</i> not reported</p> <p><i>Patient outcomes:</i> Patient-mediated intervention was not consistently effective.</p> <p><i>Provider outcomes:</i> Audit and feedback, together with educational outreach visits were the most effective in improving prescribing practice. Research identified in the areas of manual reminders, local consensus processes, and multidisciplinary teams has not altered the status of knowledge in these areas, and there is still insufficient evidence to draw conclusions about their efficacy.</p> <p><i>Process outcomes:</i> not reported</p>	+

*R-AMSTAR, a tool for assessment of multiple systematic reviews, consists of 11 items, each with various criteria which have to be satisfied with a minimum score of 11 and maximum of 44 points.

RCT=randomized controlled trial; RD= risk difference; OR= odds ratio.

Chapter 3. Conclusions and reflective thoughts

In this review of reviews, the aim was to gain insight in effective implementation strategies across a range of lifestyle interventions and preventive activities. Many of the implementation oriented reviews had heterogeneous results. Nevertheless, the majority of the papers were in favour of using professional education, e-health or multi-component implementation interventions. Multi-component oriented had the strongest positive effects. Only few reviews however reported details about possible effective elements of implementation strategies. Nevertheless, we were able to create synergy by searching for possible effective elements not only within reviews, but also across reviews.

With regard to educational oriented implementation strategies, we concluded that the majority of the reviews were supporting the use of educational activities. Locating education in practice settings, delivery by peer trainers and applying a stepwise solving approach for health problems seem to strongly stimulate positive outcomes. Locating educational sessions for care providers in practice settings seems the most logical, as this stays close to their comfort zone. When they have to act on role plays with colleagues from other practices for example, it can be hypothesised that providers are less likely to take a vulnerable position in front of unfamiliar colleagues. The evidence was insufficient to take conclusions about optimal group compositions. We did not see comparisons of e.g. solely GPs or solely nurses, compared to GPs and nurses mixed in an educational session.

Financial oriented implementation interventions showed very mixed results. In addition however, identified reviews were identified from our search and the ones included in this review had very heterogeneous interventions included. Therefore, it is not possible to draw valid conclusions on whether singly financial oriented strategies are effective.

Looking at e-health oriented interventions aiming at patient or citizen behavior change, they do seem to have either positive or strong positive effects. Effective elements of e-health interventions seem to be interactive, tailored and motivational approaches. Nonetheless, it is important to mind that not all reviews reported (significant) positive effects.

With regard to implementation strategies including combinations of at least professional education, financial or e-health, we see synergy effects. From this review it can be concluded that multi-component interventions are more effective than stand-alone implementation strategies, especially when identified implementation barriers were addressed.

Strengths and limitations

We included a number of 44 reviews, although the methodological quality of the included review was moderate, following the R-AMSTAR criteria [3]. The methodological quality was 28 on a scale from 11 to 44. The moderate overall quality also limited possibilities for doing a narrative analysis. Furthermore, the degree of heterogeneity was high. Of the 44 included reviews, 30% of the reviews were homogeneous enough to pool the studies. Moreover, aims of preventive lifestyles amongst included reviews varied greatly, as we primarily focused on applied implementation strategies rather than setting or lifestyle/disease topic.

Lastly, one of the most important limitations of the included reviews is that they in general very sparsely described effective elements of studies. This makes it difficult for us to identify and to do recommendations about effective as well as ineffective elements.

Implications

To date, the included reviews showed that details of applied implementation are sparsely described. Future research should focus on comparing reviews with supporting outcomes, to reviews with ineffective outcomes. In that way we might be able to identify determinants of

effective practice. Therefore we recommend, with the exception of financial oriented implementation strategies as this might need more robust evidence, researchers to move their focus from the *strength* of positive effects, to *determinants* that cause the positive outcomes from implementation strategies. If more evidence is available from these mechanisms, we can better explain the difference in outcomes from the various and heterogeneous reviews.

Conclusion

None of the categories of educational, financial, e-health or multi-component oriented interventions showed purely consistent positive effects. However, based on our narrative data synthesis strong trends were identified from the various reviews. Reviews of multi-component implementation strategies show that synergy is created in terms of implementation effectiveness by combining elements from different types of implementation strategies. Furthermore, the evidence base with regard to educational and e-health interventions is very clear in the positive results on provider level and patient level respectively. The effect of financial oriented interventions remains unsure and needs to be investigated further. Furthermore, determinants of effective strategies to improve preventive services should be further investigated. For example: what is the optimal intensity of an educational strategies aimed at nurses and physicians to stimulate SBI for heavy alcohol consumption; what is the optimal intensity of financially incentivising general practices in stimulating them to do screening and brief interventions; what factors of e-health strategies determine the effectiveness at patient level. In addition, applied strategies for improving the uptake of preventive care delivery in studies should be described in more detail.

Chapter 4. Appendices: search strategies and data-extraction form

SEARCH STRATEGY PUBMED DATABASE

((("meta-analysis"[Publication Type] OR "meta-analysis as topic"[MeSH Terms] OR "meta-analysis"[All Fields]) OR ("review"[Publication Type] OR "review literature as topic"[MeSH Terms] OR "systematic review"[All Fields])) AND (("quality improvement"[MeSH Terms] OR "quality"[All Fields] AND "improvement"[All Fields]) OR "quality improvement"[All Fields]) OR improvement[All Fields] OR ((Improving[All Fields] AND ("Intervention (Amstelveen)"[Journal] OR "Interv Sch Clin"[Journal] OR "intervention"[All Fields])) AND s[All Fields]) OR ((Improving[All Fields] AND ("Intervention (Amstelveen)"[Journal] OR "Interv Sch Clin"[Journal] OR "intervention"[All Fields])) AND s[All Fields]) OR Educational[All Fields] OR e-learning[All Fields] OR (Internet-based[All Fields] AND ("learning"[MeSH Terms] OR "learning"[All Fields])) OR ICT[All Fields] OR ("information science"[MeSH Terms] OR ("information"[All Fields] AND "science"[All Fields]) OR "information science"[All Fields] OR ("information"[All Fields] AND "technology"[All Fields]) OR "information technology"[All Fields]) OR ("economics"[MeSH Terms] OR "economics"[All Fields] OR "financial"[All Fields]) OR ("reimbursement, incentive"[MeSH Terms] OR ("reimbursement"[All Fields] AND "incentive"[All Fields]) OR "incentive reimbursement"[All Fields] OR ("pay"[All Fields] AND "performance"[All Fields]) OR "pay for performance"[All Fields]) OR Reimbursement[All Fields] OR ("contracts"[MeSH Terms] OR "contracts"[All Fields] OR "contracting"[All Fields]) OR Transparency[All Fields])) AND (("smoking"[MeSH Terms] OR "smoking"[All Fields]) OR ("ethanol"[MeSH Terms] OR "ethanol"[All Fields] OR "alcohol"[All Fields] OR "alcohols"[MeSH Terms] OR "alcohols"[All Fields]) OR ("exercise"[MeSH Terms] OR "exercise"[All Fields]) OR ("diet"[MeSH Terms] OR "diet"[All Fields]))))

SEARCH STRATEGY CENTRAL DATABASE

(quality improvement) or (improvement) or (improving interventions (s)) or (educational) or (e-learning) or (internet-based learning) or (ICT) or (information technology) or (financial) or (pay for performance) or (reimbursement) or (contracting) or (transparency)

(smoking) or (alcohol) or (exercise) or (diet)

#1 and #2

#3 and (prevent\$ or (health near/2 promotion))

Screening for inclusion/exclusion in the review of reviews (step 1 of 3-stepped approach)

Comments can be made either at the question itself or on a separate sheet (please specify question number)

Name reviewer:

Overall variables to score:

Author	Aim	Topic (lifestyle, prevention or other)	Setting	Patients	Implementation strategy	Participants	N studies	Results	Conclusion of authors	Remarks for ODHIN?	R-AMSTAR scores on q1 to q11	Measurements of process measures

6. REFERENCES

1. Murray, C.J., et al., *Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet, 2012. **380**(9859): p. 2197-223.
2. Alwan, A., et al., *Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries*. The Lancet, 2010. **376**(9755): p. 1861-1868.
3. Kung, J., et al., *From Systematic Reviews to Clinical Recommendations for Evidence-Based Health Care: Validation of Revised Assessment of Multiple Systematic Reviews (R-AMSTAR) for Grading of Clinical Relevance*. Open Dent J, 2010. **4**: p. 84-91.
4. World Health Organization, *Noncommunicable diseases country profiles 2011*, 2011, World Health Organization: Geneva.
5. World Health Organization, *Global health risks: mortality and burden of disease attributable to selected major risks*, 2009, World Health Organization: Geneva.
6. Fiore, M.C. and T.B. Baker, *Clinical practice. Treating smokers in the health care setting*. N Engl J Med, 2011. **365**(13): p. 1222-31.
7. Lin HH, Ezzati M, and Murray M, *Tobacco smoke, indoor air pollution and tuberculosis: a systematic review and metaanalysis*. PLoS Medicine, 2007. **4**(1): p. e20.
8. Kaner, E.F., et al., *Effectiveness of brief alcohol interventions in primary care populations*. Cochrane Database Syst Rev, 2007(2): p. CD004148.
9. Murray, E., et al. *Interactive Health Communication Applications for people with chronic disease*. Cochrane Database of Systematic Reviews, 2005. DOI: 10.1002/14651858.CD004274.pub4.
10. *Global status report on noncommunicable diseases 2010*, 2011, World Health Organization: Geneva.
11. Anderson, P., *Overview of interventions to enhance primary-care provider management of patients with substance-use disorders*. Drug Alcohol Rev, 2009. **28**(5): p. 567-574.
12. Michie, S., *Designing and implementing behaviour change interventions to improve population health*. J Health Serv Res Policy, 2008. **13** Suppl 3: p. 64-9.
13. Noordman, J., et al., *Do trained practice nurses apply motivational interviewing techniques in primary care consultations?* J Clin Med Res, 2012. **4**(6): p. 393-401.
14. Jansink, R., et al., *Minimal improvement of nurses' motivational interviewing skills in routine diabetes care one year after training: a cluster randomized trial*. BMC Fam Pract, 2013. **14**: p. 44.
15. Forsetlund, L., et al., *Continuing education meetings and workshops: effects on professional practice and health care outcomes*. Cochrane Database Syst Rev, 2009(2): p. CD003030.
16. Gosden, T., et al., *Capitation, salary, fee-forservice and mixed systems of payment: effects on the behaviour of primary care physicians*. Cochrane Database of Systematic Reviews, 2000(3).
17. Grol, R., *Personal paper. Beliefs and evidence in changing clinical practice*. BMJ, 1997. **315**(7105): p. 418-21.
18. Grol, R., R. Baker, and F. Moss, eds. *Quality Improvement Research: understanding the science of change in health care*. 2004, BMJ Publishing Group: London.
19. Grol, R. and J. Grimshaw, *Evidence-based implementation of evidence-based medicine*. Jt Comm J Qual Improv, 1999. **25**(10): p. 503-13.

20. Harkness, E.F. and P.J. Bower, *On-site mental health workers delivering psychological therapy and psychosocial interventions to patients in primary care: effects on the professional practice of primary care providers*. Cochrane Database of Systematic Reviews, 2009(1).
21. Jamtvedt, G., et al., *Audit and feedback: effects on professional practice and health care outcomes*. Cochrane Database of Systematic Reviews, 2006(2).
22. Laurant, M., et al., *Substitution of doctors by nurses in primary care*. The Cochrane Database of Systematic Reviews, 2005(4).
23. McGlynn, E.A., et al., *The quality of health care delivered to adults in the United States*. 2003, 2003. **348**(26): p. 2635-45.
24. O'Brien, M.A., et al., *Educational outreach visits: effects on professional practice and health care outcomes*. Cochrane Database Syst Rev, 2007(4): p. CD000409.
25. Wensing, M.J.P., H.C.H. Wollersheim, and R.P.T.M. Grol, *Organisational interventions to implement improvements in patient care: a structured review of reviews*. Implement Sci, 2006. **1**(2).
26. Grol, R. and R. Jones, *Twenty years of implementation research*. Fam Pract, 2000. **17 Suppl 1**: p. S32-5.
27. Grol, R. and J. Grimshaw, *From best evidence to best practice: effective implementation of change in patients' care*. Lancet, 2003. **11**(362): p. 1225-30.
28. Goderis, G., et al., *Barriers and facilitators to evidence based care of type 2 diabetes patients: experiences of general practitioners participating to a quality improvement program*. Implement Sci, 2009. **4**(41).
29. Moher, D., et al., *Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement*. BMJ, 2009. **339**(b2535).
30. Smith, V., et al., *Methodology in conducting a systematic review of systematic reviews of healthcare interventions*. BMC Med Res Methodol, 2011. **11**(1): p. 15.
31. Akl, E.A., et al., *Educational games for health professionals*. Cochrane Database Syst Rev, 2008(1): p. CD006411.
32. Spiby, H., et al., *A systematic review of education and evidence-based practice interventions with health professionals and breast feeding counsellors on duration of breast feeding*. Midwifery, 2009. **25**(1): p. 50-61.
33. Soderlund, L.L., et al., *A systematic review of motivational interviewing training for general health care practitioners*. Patient Educ Couns, 2011. **84**(1): p. 16-26.
34. Beranova, E. and C. Sykes, *A systematic review of computer-based softwares for educating patients with coronary heart disease*. Patient Educ Couns, 2007. **66**(1): p. 21-8.
35. Bailey, J.V., et al., *Interactive computer-based interventions for sexual health promotion*. Cochrane Database Syst Rev, 2010(9): p. CD006483.
36. Bewick, B.M., et al., *The effectiveness of web-based interventions designed to decrease alcohol consumption--a systematic review*. Prev Med, 2008. **47**(1): p. 17-26.
37. Carey, K.B., et al., *Computer-delivered interventions to reduce college student drinking: a meta-analysis*. Addiction, 2009. **104**(11): p. 1807-19.
38. Reavley, N. and A.F. Jorm, *Prevention and early intervention to improve mental health in higher education students: a review*. Early Interv Psychiatry, 2010. **4**(2): p. 132-42.
39. Riper, H., et al., *Effectiveness of E-self-help interventions for curbing adult problem drinking: a meta-analysis*. J Med Internet Res, 2011. **13**(2): p. e42.
40. Riper, H., et al., *Curbing problem drinking with personalized-feedback interventions: a meta-analysis*. Am J Prev Med, 2009. **36**(3): p. 247-55.
41. Tait, R.J. and H. Christensen, *Internet-based interventions for young people with problematic substance use: a systematic review*. Med J Aust, 2010. **192**(11 Suppl): p. S15-21.
42. White, A., et al., *Online alcohol interventions: a systematic review*. J Med Internet Res, 2010. **12**(5): p. e62.

43. Farmer, A.P., et al., *Printed educational materials: effects on professional practice and health care outcomes*. Cochrane Database Syst Rev, 2008(3): p. CD004398.
44. Mansouri, N., et al., *The change in attitude and knowledge of health care personnel and general population following trainings provided during integration of mental health in Primary Health Care in Iran: a systematic review*. Int J Ment Health Syst, 2009. **3**(1): p. 15.
45. Nilsen, P., et al., *Effectiveness of strategies to implement brief alcohol intervention in primary healthcare. A systematic review*. Scand J Prim Health Care, 2006. **24**(1): p. 5-15.
46. Ross, S. and Y.K. Loke, *Do educational interventions improve prescribing by medical students and junior doctors? A systematic review*. Br J Clin Pharmacol, 2009. **67**(6): p. 662-70.
47. Mehrotra, A., et al., *Pay for performance in the hospital setting: what is the state of the evidence?* Am J Med Qual, 2009. **24**(1): p. 19-28.
48. Scott, A., et al., *The effect of financial incentives on the quality of health care provided by primary care physicians*. Cochrane Database Syst Rev, 2011(9): p. CD008451.
49. Sturm, H., et al., *Pharmaceutical policies: effects of financial incentives for prescribers*. Cochrane Database Syst Rev, 2007(3): p. CD006731.
50. Witter, S., et al., *Paying for performance to improve the delivery of health interventions in low- and middle-income countries*. Cochrane Database Syst Rev, 2012. **2**: p. CD007899.
51. Car, J., et al., *Interventions for enhancing consumers' online health literacy*. Cochrane Database Syst Rev, 2011(6): p. CD007092.
52. Civljak, M., et al., *Internet-based interventions for smoking cessation*. Cochrane Database Syst Rev, 2010(9): p. CD007078.
53. Currell, R., et al. *Telemedicine versus face to face patient care: effects on professional practice and health care outcomes*. Cochrane Database of Systematic Reviews, 2000. DOI: 10.1002/14651858.CD002098.
54. Garcia-Lizana, F. and A. Sarria-Santamera, *New technologies for chronic disease management and control: a systematic review*. J Telemed Telecare, 2007. **13**(2): p. 62-8.
55. Harris, J., et al., *Adaptive e-learning to improve dietary behaviour: a systematic review and cost-effectiveness analysis*. Health Technol Assess, 2011. **15**(37): p. 1-160.
56. Lustria, M.L., et al., *Computer-tailored health interventions delivered over the Web: review and analysis of key components*. Patient Educ Couns, 2009. **74**(2): p. 156-73.
57. McLean, S., et al., *Telehealthcare for asthma*. Cochrane Database Syst Rev, 2010(10): p. CD007717.
58. Portnoy, D.B., et al., *Computer-delivered interventions for health promotion and behavioral risk reduction: a meta-analysis of 75 randomized controlled trials, 1988-2007*. Prev Med, 2008. **47**(1): p. 3-16.
59. Ryhanen, A.M., et al., *The effects of Internet or interactive computer-based patient education in the field of breast cancer: a systematic literature review*. Patient Educ Couns, 2010. **79**(1): p. 5-13.
60. Tate, D.F., et al., *Cost effectiveness of internet interventions: review and recommendations*. Ann Behav Med, 2009. **38**(1): p. 40-5.
61. Verhoeven, F., et al., *The contribution of teleconsultation and videoconferencing to diabetes care: a systematic literature review*. J Med Internet Res, 2007. **9**(5): p. e37.
62. Walters, S.T., J.A. Wright, and R. Shegog, *A review of computer and Internet-based interventions for smoking behavior*. Addict Behav, 2006. **31**(2): p. 264-77.
63. Webb, T.L., et al., *Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy*. J Med Internet Res, 2010. **12**(1): p. e4.
64. Aboelela, S.W., P.W. Stone, and E.L. Larson, *Effectiveness of bundled behavioural interventions to control healthcare-associated infections: a systematic review of the literature*. J Hosp Infect, 2007. **66**(2): p. 101-8.

65. Akbari, A., et al., *Interventions to improve outpatient referrals from primary care to secondary care*. Cochrane Database Syst Rev, 2008(4): p. CD005471.
66. Chaillet, N., et al., *Evidence-based strategies for implementing guidelines in obstetrics: a systematic review*. Obstet Gynecol, 2006. **108**(5): p. 1234-45.
67. Chaillet, N. and A. Dumont, *Evidence-based strategies for reducing cesarean section rates: a meta-analysis*. Birth, 2007. **34**(1): p. 53-64.
68. Flodgren, G., et al., *Interventions to change the behaviour of health professionals and the organisation of care to promote weight reduction in overweight and obese people*. Cochrane Database Syst Rev, 2010(3): p. CD000984.
69. Gould, D.J., et al., *Interventions to improve hand hygiene compliance in patient care*. Cochrane Database Syst Rev, 2010(9): p. CD005186.
70. Harvey, E.L., et al., *An updated systematic review of interventions to improve health professionals' management of obesity*. Obes Rev, 2002. **3**(1): p. 45-55.
71. Kastner, M. and S.E. Straus, *Clinical decision support tools for osteoporosis disease management: a systematic review of randomized controlled trials*. J Gen Intern Med, 2008. **23**(12): p. 2095-105.
72. Ostini, R., et al., *Systematic review of interventions to improve prescribing*. Ann Pharmacother, 2009. **43**(3): p. 502-13.