

Chapter 10

General Discussion: Stepping into the Future



The Dutch society faces major challenges in the work setting for the future, including retirement at higher age, a rapidly aging workforce, a growing number of employees with chronic diseases, and fewer young people who enter the workforce [1]. Diverse parties, among others the Dutch government and the Netherlands Society of Occupational Medicine (NVAB), consider improving employees' lifestyle via preventive measures a potentially effective tool to maintain a productive workforce, and prolong or sustain healthy employability of workers for the future [2].

This thesis addresses the need for occupational health professionals to play a more active - key - intervening role with regard to preventing weight gain among employees [3]. To meet this need, a draft evidence-based practice guideline was developed and evaluated among occupational physicians in the Netherlands. Based on the results presented in this thesis, the NVAB will decide whether the guideline in its current form can be authorized and published. This chapter aims to support the NVAB in her decision.

Section 1 of this chapter summarizes and discusses the main relevant findings and conclusions of this thesis. In sections 2 and 3, these findings are used to identify issues that prevail in the research context and the policy and practice context, respectively. Section 2 discusses a selection of considerations that warrant further exploration in relation to methodology, theory failure and program failure. Section 3 discusses shortcomings of the present disease-based care approach, new problems that arise when changing to a health-based care approach, as well as opportunities for a health-based care approach in Dutch policy. Finally, section 4 provides an overall conclusion, and recommendations for the NVAB, the stakeholders in the case description, the research community and for policy makers.

1. Relevant findings

Development of the guideline

Chapter 2 describes a systematic review including meta-analyses that was conducted to support the development of the draft guideline. From this review, we conclude that workplace physical activity *and* dietary behavior interventions can significantly reduce body weight (pooled estimate -1.2 kg). No conclusions could be drawn about effects on waist circumference, sum of skinfolds and waist-hip ratio due to the limited number of studies. Interventions containing an environmental component showed an additional reduction in body weight (pooled estimate -0.3 kg), supporting our decision to recommend the combination of workplace physical activity *and* dietary behavior interventions including an environment component, in order to prevent weight gain.

Chapter 3 describes the systematic development of the draft guideline, and the design for evaluation and implementation of the guideline. OPs in the control group were asked to provide care as usual, which generally consisted of the health risk appraisal with anthropometric measurements and a subsequent health advice. OPs in the intervention group followed the guideline by conducting five face-to-face behavioral change counseling sessions with employees to improve their lifestyle during 6 months, providing advice to employers on how to assess and intervene the obesogenic work environment, and addressing evaluation and maintenance of the guideline. The intervention was evaluated in a RCT design among 16 OPs and 523 employees.

Evaluation of the guideline

The process evaluation in **Chapter 4** describes that among OPs, behavioral change counseling was not performed to the full extent, the environmental scan was performed adequate by only one OP, and none of the OPs adequately addressed evaluation and maintenance of the guideline. Among intervention employees, reach (86%), satisfaction (7.1) and attendance rates (4.4 of out 5 sessions) were generally high. Moreover, intervention employees with higher attendance and satisfaction rates significantly improved their waist circumference (-1.5 cm to -2.1 cm) and body weight (-0.9 kg to -1.4 kg) at 6 months follow-up. Directly after the 6-months intervention period, **chapter 5** concludes that guideline-based care resulted in a more favorable sedentary behavior at work (β -28 min per day, 95% CI -2; -54) and increased fruit intake (β 2.1 pieces per week; 95% CI 0.6; 3.6), but did not improve employees' physical activity, snack intake or body weight-related outcomes. After 18 months follow-up, **chapter 6** shows that guideline-based care was neither more effective on body weight-related outcomes, blood pressure, total serum cholesterol or quality of life than usual care. The increased fruit intake (β 1.9 pieces per week; 95% CI 0.4; 3.4) was sustained (*unpublished data*). Based on the economic evaluation in **chapter 7**, it appears that guideline-based care is neither cost-effective from a societal perspective, nor cost-beneficial from the employers' perspective.

Implementation of the guideline

Besides effectiveness, other factors - such as compatibility with current practice and the OPs knowledge and skills - are important for actual implementation of evidence-based guidelines as well. **Chapter 8** therefore describes barriers and facilitators to implementation of the guideline, as mentioned by OPs and employers. From this study we conclude that there is a broad societal basis and organizational support among OPs and employers for implementing the draft guideline, but that resources, structures and support for continuation are persistent barriers that need more attention.

Finally, gaps in knowledge regarding the clinical utility of waist circumference are discussed in **chapter 9**. Based on literature, we conclude that it may be difficult to accurately monitor changes in waist circumference of individual subjects over time in clinical practice, due to the large measurement error and unclear definition of clinically relevant change.

2. Issues in the research context

Methodological issues

Methodological strengths and limitations of the studies included in this thesis have been discussed in the previous chapters. However, a selection of methodological issues in relation to the study design, study population, and choice of outcome measures warrant further exploration.

Study design

The guideline was evaluated in a randomized controlled trial (RCT) (chapters 4-7). For evaluation of interventions, the RCT is the strongest and most transparent research design for attributing causality to differences between study groups because it is less susceptible to selection bias and confounding than other designs [4]. In our study, randomization was performed at the OP-level in order to minimize contamination between the study groups. The randomization procedure was performed adequately (i.e. by a computer generated list), and analyses were conducted according to the intention-to-treat principle (i.e. all participants were analyzed as randomized). The randomization procedure, however, led to significant differences between intervention and control employees at baseline. Intervention employees were younger (46 versus 48 years) and worked less often in irregular work hours (19% versus 29%). To account for this bias, all results were adjusted for age and irregular work hours.

To account for the dependency of observations (of measurements within employees, and of employees within OPs) and our unbalanced data (the number of employees differed per OP), multilevel analyses were conducted in chapters 4-6. An advantage of performing multilevel analyses is that missing data are adequately addressed by a maximum likelihood estimation procedure that allows for all available data to be used in the analyses [5]. An unexpected problem that we encountered was the occurrence of non-random missing data at the third measurement due to time constraints at one intervention company. Also, it was not possible to perform multilevel analyses for the economic evaluation in chapter 7 because the statistical methods to perform multilevel analyses, bootstrap analyses and joint cost-effectiveness analyses were available in different statistical packages. Ignoring these problems may lead to an over- or underestimation of results and significance. In our analyses, we therefore 1) performed extensive sensitivity analyses to test the robustness of our results and 2) applied multiple imputation techniques in chapter 7 to account for missing data. The sensitivity analyses revealed that effects on body weight-related outcomes and health-related outcomes differed slightly between imputed data, multilevel data and complete cases (unpublished data). Nevertheless, it seems unlikely that our conclusions on the effectiveness of the guideline would change if complete data was present, considering the similar lack of results across analyses. We do encourage future statistical research to examine the issue of non-random missing data in multilevel analyses, as well as the practical application of multilevel economic analyses.

Study population

To date, occupational health care in the Netherlands mainly focuses on sickness absence management and return to work, i.e. secondary and tertiary prevention [6]. Interventions aimed at primary prevention, and the promotion of a healthy lifestyle in particular, are hardly implemented. Evidence suggests that such interventions in an occupational health setting could be effective and feasible [2]. For the guideline, we therefore chose a primary prevention approach. Primary prevention efforts in the workplace are directed at employed populations that are generally healthy. This approach aims to shift the entire distribution of

exposure in a favorable direction by limiting the incidence of disease by controlling causes and risk factors [7]. A drawback of this approach is that it may offer little health benefit to individuals because their absolute risks of disease are relatively low. Similar to our results, population interventions for preventing weight gain have largely shown small, short-term effects on body weight-, health- and work-related measures [8-10]. Comparable programs among high-risk populations indeed found better results on these outcomes, presumably because high risk participants are more likely to achieve measurable changes in behavior [11]. The high risk approach however, only partially solves the origin of the problem [12]. To achieve a meaningful degree of prevention and protection at the workplace, ultimately a combination of primary, secondary and tertiary interventions may be needed [7,13,14].

Considering the methodological quality criteria included in chapter 2, our study is of good quality (score 8) [15]. We were able to obtain a sufficiently large sample size and a long follow-up duration. Also, employee attendance and satisfaction rates were generally high. Although the percentage of employees lost to follow-up did not exceed 30%, they were more often younger, females, and had a lower income than employees who completed the study. This may indicate that preferences and applicability of the intervention may differ for these groups. Inevitably, a selection bias of motivated employees and OPs occurred, implying that the generalizability of our results may be lower towards less motivated employees and OPs. In line, as only a small group of all OPs in the Netherlands (2%) participated in our study, generalizability of our results may be limited towards the total population of Dutch OPs. Our study should thus be considered a pragmatic trial (i.e. a trial that provides a compromise between an efficacy and effectiveness trial, as it reflects the heterogeneity of patients in actual clinical practice, minimizes exclusion criteria, and allows for variation in context, diagnosis and treatment), as opposed to an efficacy trial (i.e. a trial that determines if an intervention produces the expected result under ideal circumstances) or an effectiveness trial (i.e. a trial that measures the degree of beneficial effect under “real world” clinical settings) [16,17].

Outcome measures

Waist circumference was selected as the primary outcome measure of our study for its ability to better predict obesity-related disorders than BMI, its high reliability to assess a person’s clinical status (i.e. as overweight or obese), and its feasibility in clinical practice (i.e. easy to learn, quickly measured, at low cost)[18]. Although in our trial reliability was good (chapter 6), OPs stated they found it difficult to measure the waist circumference (chapters 4 and 8) due to difficulties in locating the designated measurement location, and due to variations in anatomical factors such as muscle mass, lean tissue, and posture. This led us to discuss gaps in knowledge regarding the clinical utility of measuring waist circumference in chapter 9. We conclude that there is insufficient evidence to support waist circumference as a good measure for monitoring change in individuals over time in clinical practice because of a large measurement error and an unclear definition of clinically relevant change. For clinical practice, we recommend research to focus on ways to more accurately measure waist

circumference (preferably by technological devices [14]), in order for clinicians to accurately assess an individuals' clinical status (to provide appropriate care), and to accurately monitor small changes in waist circumference beyond measurement error (to assess improvements). The influence of measurement error on our results however may be limited as we compared group mean's, not individual measurements [19].

The use of subjective measurement instruments should also be discussed. In our study we chose questionnaires over objective measures to assess daily physical activity, sedentary behavior and dietary behavior, because we were interested in changes in (sub)behaviors rather than in total energy intake or expenditure. Also, questionnaires are more compatible with clinical practice in terms of time, resources, and feasibility. Others however, suggest that objective measures in addition to subjective measures may provide better estimates of effects, such as heart rate monitors [20][21][22]. We expect that the subjective instruments did not affect the difference in behavior change between groups, as the same instruments were used among both groups. Nevertheless, in order to more precisely detect effects future research could focus on obtaining more solid standards for the assessment of overall physical activity, sedentary behavior or diet in public or occupational health settings [23].

Theory and program failure

Besides methodological issues, our results can be further discussed in the light of possible theory failure or program failure [24]. Theory failure implies that an intervention has been implemented well, but did not lead to improvement on the study outcomes. Program failure indicates that no improvements are found because the intervention was poorly implemented or the program did not adequately address required actions.

Theory failure

In our study, a minimal intervention strategy was evaluated in which employees were offered a maximum of five behavioral change counseling sessions during 6 months. Rationale for this intervention strategy was the restricted time OPs stated to have available during the design of the intervention, and the assumption that the 2-day training with role-play would be sufficient to produce significant improvements in behavioral change counseling skills [25], body weight [26], and lifestyle behaviors [27-29]. This made our intervention well-structured, but probably not intensive enough. In line with our results, a recent review found that minimal fruit interventions are sufficient to increase average fruit intake [22]. However, reviews on worksite physical activity and nutrition programs suggest that more intensive interventions may be necessary to improve physical activity and dietary behavior [15,30-33], including for example more frequent counseling sessions, exercise schemes or group counseling sessions.

A second consideration is that due to practical constraints, the guideline did not explicitly account for all other modifiable risk factors that may influence body weight and lifestyle behaviors as well, such as social stressors at work [34], smoking, alcohol use, psychosocial issues, or the home situation [35]. The behavioral change counseling technique allowed for OPs and employees to address issues other than preventing weight gain. However,

interventions that account for these multiple factors, prioritized and selected by the employee, may be more effective because they facilitates employees' involvement in the program through a variety of entry channels [13]. Future occupational health research needs to focus on ways to adequately address multiple factors in a practical manner.

Program failure

Chapters 4 and 8 describe that the intervention was not fully implemented as intended on all three guideline components. The process evaluation (chapter 4) showed that only one intervention OP was able to change the obesogenic environment. The other six OPs stated it was difficult to address the obesogenic environment because there were already (sufficient) events or facilities present, there was not enough time to implement changes, or it did not get priority from the employer. In hindsight, the guideline could have provided OPs with better practical guidance or materials to implement simple environmental changes that have shown to be effective, such as prompts, point-of-purchase signs, and food labeling. Also, a linkage board might have encouraged support from all stakeholders, and more attention could have been paid in the guideline training to physician–employer communication skills. If such strategies among OPs can indeed improve the obesogenic environment, remains to be further explored.

Program failure may also be implied because the behavioral change counseling technique was provided well but not to the full extent, because co-intervention was applied by one control OP, and because the control group received four health risk appraisal with feedback for evaluation purposes as well. These factors might have limited the contrast between the intervention and control group. A previous study among Dutch OPs and nurses showed that significant intervention effects can be achieved from behavioral change counseling techniques [36]. To achieve this, the guideline could be adapted to consider a phased behavioral change counseling education, including sufficient time and attention for relapse prevention, changing OPs' routines, and support from colleagues (in for example peer medical audit groups) [36]. Despite full proficiency however, our OPs were satisfied with the behavioral change counseling technique as it allowed them to better address resistance of employees, and was useful in other situations, such as sickness absence management, as well.

Finally, some level of program failure is plausible because none of the OPs used the guideline after the 6-months intervention period (evaluation and maintenance section of the guideline), nor did their companies adopt the guideline. During the development of the guideline, employers made us aware that evaluation and maintenance plans rarely exist for company health initiatives. We therefore addressed evaluation and maintenance in a separate section in the guideline. Nevertheless, OPs stated that this section was too difficult for them because the subject of preventing weight gain was neither linked to their work in occupational safety and disease management, nor easy to embed within the company's policy (chapter 8). Integrating health as a behavior of a company may be necessary to achieve evaluation and maintenance of health promotion programs [37], and may enhance effectiveness [38]. We encourage research to focus more on this point. For example,

a linkage board might encourage collaboration among stakeholders and thereby increase the chance of effective implementation.

Summary and interpretations

The issues as discussed above make clear that although the draft guideline contains best evidence and practice recommendations, these recommendations did not sufficiently enhance employee health or the quality of care. In part, this is due to issues in the research context. For example, the low ability to embed the recommended activities of the guideline in current practice. Also, this may be due to the basic principle that the guideline described an optimal situation, rather than formulating recommendations for the existing situation in the Netherlands. Literature and this thesis provide suggestions for improvements that may enhance the effectiveness of an adapted version of the guideline, such as providing a more intensive intervention aimed at multiple individual and environmental factors, that provides better practical guidance and materials for OPs, is implemented well, and able to more precisely detect effects. Also, the guideline could include primary, secondary and tertiary prevention, link health promotion to occupational health and safety, and increase attention for evaluation and maintenance in policy and culture. Adapting the guideline, however, would not ensure that desired effects are produced. Moreover, these adaptations would lead to a guideline that may by far exceed what is feasible for OPs in routine clinical practice [39]. Occupational physicians are generally not trained in prevention in lifestyle issues or in motivational interviewing, and the time needed to conduct these preventive activities exceeds the time they generally have [6]. Also, the draft guideline was evaluated among a motivated group of “innovators” (those first to adopt an innovation [40]), while in practice even more barriers to implementation may apply [39]. Considering the extent of the propositions, an adapted guideline would require another evaluation. These considerations imply that the guideline is part of a continuous improvement cycle. Four years ago, the draft guideline was developed based on the latest research. Evaluation of the guideline now calls for better theory and program forming in research to reduce the chance of failure in future programs. The results of this guideline should therefore not only be considered in the research context, but in the current policy and practice context as well.

3. Issues in the policy and practice context

From treatment to prevention

In order to contain costs and to prolong and sustain healthy employability of employees for the future, the Dutch Institute for Public Health and Environment stated that a shift from treatment to prevention is necessary in public health [41]. Support for such a shift is apparent from others as well [9,14,42]. For example, occupational healthcare in the Netherlands is changing from a main focus on sickness absence and disability, toward more involvement in preventing occupational or work-related diseases and improving participation and functioning at work [3]. On a larger scale, the WHO noted this as the paradigm shift from occupational health to workers' health in order to promote and improve all aspects of workers health. At the core, this approach includes all workers, all health determinants, all

relevant stakeholders, considers shared responsibility and extends beyond the workplace [42]. On all levels, there is a disparity between our scientific knowledge about prevention and the practical and effective implementation of preventive approaches. To address this disparity and successfully shift from treatment to prevention on a larger scale, Matheson et al. (2011) propose a transition from disease-based care to health-based care [14].

Present disease-based care approach

Matheson et al. (2011) describe several reasons why our current disease-based health care system is not well suited for integrating preventive measures. First, the feature of our health care delivery system to divide complex health problems into smaller, more understandable parts, functions well for acute and simple diseases such as acute appendicitis. For chronic and complex diseases such as obesity, however, multiple factors are often responsible for the disease development or presentation [43]. Consequently, similar to our conclusion, a system that accounts for these multiple factors may provide better and more effective care. Also, such a system allows for the integration of care, and therefore supports the multidisciplinary approach that is needed for preventing chronic diseases [14].

Second, our disease-based care education system mainly provides biomedical education, and merely provides preventive education on work-related risk factors. Initiatives to provide education on prevention are undertaken in the Netherlands, such as motivational interviewing courses for occupational health professionals, but most education is still largely inadequate and techniques such as motivational interviewing or exercise prescription are rarely incorporated in the basic curriculum [44].

Third, it has been widely recognized that changing health behaviors is difficult. Although many people would like to lose weight or exercise more, one third of our population is overweight, and half of our population fails to meet physical activity guidelines [45]. Generally, people prefer an immediate benefit rather than a delayed benefit, even if the delayed benefit has a larger impact [46]. Moreover, people discount long-term negative consequences of a behavior that provides instant gratification. Immediate consequences of a disease may therefore motivate people to adhere to therapeutic advice, but the lack of immediate consequences of unhealthy behavior often does not motivate people enough to adhere to lifestyle advice [46]. To support changing complex health behaviors in (relatively) healthy people, pricing strategies, legislation, and changes in the physical and social environment are proposed as most promising strategies [41]. In our study, only environmental strategies were described. However, well-conducted, effective studies are still scarce.

Finally, as evident in our study, physicians struggle with preventive care due to barriers such as the lack of support structures, the lack of sufficient training and feedback in prevention, the dominance of their on-going treatment tasks, and the lack of collaboration with other healthcare professionals. As a result, physician-based counseling has mainly led to short-term health improvements, and rarely to sustained health changes or sustained environmental changes. In such a system, it can be questioned if physicians can perform tasks regarding diseases management as well as prevention.

Changing to health-based care approach

To successfully shift from a disease-based care system to a health-based care system, several issues should be taken into account. Currently, there is no profession specifically aimed at prevention and management of chronic lifestyle-related diseases [14]. It remains to be established if such a profession should be created or adapted from existing professions. Nevertheless, such a profession would require education in epidemiology, prevention, counseling skills, lifestyle behavior, behavior change, and monitoring. Moreover, such a profession would emphasize self-care, repeated counseling, collaboration with other physicians - especially for individuals at risk, and performing adequate follow-up, both in group and individual settings. As a starting point for future interventions, individuals could be screened for risk of chronic diseases. Subjects at risk could then receive medical supervision, and subjects at low risk medical direction.

Another issue is that the disease-based care system makes people dependent on the system, but the client-centered health-based care system will require people to take responsibility for their own health [14]. However, solely addressing people on their own responsibility for prevention of complex chronic lifestyle-related diseases, that result from a wide range of voluntary and involuntary causal factors, rises ethical dilemmas (conflicts of ethical values) [47]. Workplace health promotion programs are justified because both employee and employer might benefit. However, dilemmas can arise when participation is not fully voluntary, or when forms of pressure, seduction or compulsion are applied to motivate employees. Furthermore, it has been shown that workers with an unhealthy lifestyle or poor health are more likely to have reluctance against employer interference, due to fear of potential consequences of participation (“blaming the victim”) [48]. Because disrespecting ethical values may affect a program’s effectiveness or have unintended consequences [12], workplace health promotion programs need to address ethical issues in their communication, design and implementation as well [49]. For example, creating awareness among employees that participation is voluntary, the OP has an independent position, and that there are no consequences to participation may reduce resistance.

To support people in taking responsibility for their own health, technological measures can provide key support [50]. Technology can make health information instantly available, understandable and personally relevant. For example, tracking devices can help people monitor their compliance and adherence to physical activity norms, as people tend to overestimate the time and intensity of physical activity [51]. Also, there is evidence that computer-tailored programs can be more effective in changing lifestyle risk factors than traditional approaches [52]. The use of technology will increase substantially over the next decade [53], reducing its complexity and generating more precise and usable outputs. A recent example is the use of a continuous self-monitoring wristband with software to assess daily energy intake and expenditure, that enhances lifestyle changes through monitoring and real-time feedback [50]. Moreover, it would be useful to implement technology for accurately measuring outcome measures, such as the waist circumference.

Opportunities in the Netherlands

Despite these issues, there is wide support for a health-based care approach in the Netherlands among important stakeholders. For example, the government initiated the “Ik Kies Bewust” logo to facilitate healthy food choices, and the “Beweegkuur”, a lifestyle program for individuals at risk of diabetes type 2 via the general practitioner. Moreover, health insurers contribute to this approach by reimbursing programs. The “Convenant Gezond Gewicht”, a collaboration of 27 parties ranging from the government and companies to non-profit organizations, is an important initiative that aims to address overweight and obesity across multiple settings: work, school, consumers and leisure time. The Royal College of Physicians (KNMG) has organized a number of conferences and activities to stimulate prevention. Also, in recent years medical associations are producing multidisciplinary health guidelines, such as the 2008 guideline “Diagnose and Treatment of Obesity” and draft guideline “Prevention Consult, module Cardiometabolic Risk”. Finally, an increasing number of companies and occupational health services are implementing health promotion activities, such as the Fortis bank lifestyle program. Employers’ motives to participate are not just related to absenteeism prevention, but to corporate social responsibility and sustained employability as well. Although few newly approved interventions actually save money, the notion that they may improve health at a reasonable expense could be key to achieving greater support from private and public employers [13]. These examples show that population health promotion initiatives are going-on and feasible. Effects on improving and maintaining a healthy lifestyle, especially on the longer term, however, are still relatively unknown and need more attention.

From an occupational health point of view, a health-based care approach receives support as well [6]. The demographic changes in the working population not only affect occupational physicians, but general practitioners and (para)medical specialists as well. Hence, a multidisciplinary approach will be required for the broad occupational health delivery. Collaborating and integrating occupational health care at an early stage in the treatment process may also increase societal participation of employees with (chronic) diseases [3]. Other ways of organizing occupational health care are indeed starting to emerge. Several clinical occupational health professionals (e.g. medical doctors, occupational health nurses) are now more often employed in multidisciplinary teams in hospitals and primary care centers. Also, the NVAB has become actively involved in developing multidisciplinary guidelines in collaboration with other (para)medical professionals. The role of OPs however, remains an issue for further discussion considering that over the next 20 years, 65% of the practicing OPs will retire while over the last years very few new physicians enroll for the profession of occupational physician [54]. Moreover, although 80% of the employees do not frequently visit the OP, evidence suggests that more employees are reached via the workplace who would normally not visit the general practitioner [55]. Large companies are likely to retain occupational health care in their organization, but for small enterprises occupational healthcare may need to be organized at branch level, or perhaps partly delivered in a primary care setting [3].

Summary and interpretations

From the policy and practice perspective, our current disease-based health care system is not well suited for integrating preventive measures because this system does not account for multiple factors, prevention is not integrated in education, there is a lack of environmental cues to facilitate behavior change, and there are persistent barriers for physicians to conduct preventive care. In order to successfully shift from a disease-based care system to a health-based care system, factors such as a profession, responsibility and technological measures may need to be further addressed. Nevertheless, opportunities do exist as there is a wide support from all stakeholders to perform preventive measures. The question that now remains is: what are practical implications for the draft guideline?

We do not have to wait for research to improve in the continuous improvement cycle. A possibility is to combine the (few) positive findings and trends in our project with the, on high-risk groups oriented approach, guideline on Prevention Consult for cardiometabolic risks, which is currently tested in the Dutch occupational setting. This primary health care guideline aims for OPs to structurally assess the risk of CVD, diabetes and chronic kidney disease via an online tool in people aged 45 years and older. It provides a subsequent health advice or referral to guidance and/or treatment by health professionals such as dietitians, physiotherapists or general practitioners, and to lifestyle programs for example to quit smoking, increase physical activity or healthy nutrition. The Prevention Consult addresses circumstances that were not addressed in our guideline, such as a structural, multidisciplinary approach, aimed at multiple factors, that facilitates collaboration with qualified and less expensive health professionals and that is partly reimbursed by health insurers. Our guideline could contribute to the Prevention Consult by addressing specific interventions for primary prevention of overweight and obesity, possibly in the obesogenic work environment, and considering behavioral change counseling techniques. Considering this discussion, there are still some circumstances that are not addressed in the Prevention Consult, such as engaging a linkage board to facilitate management support and implementation of the guideline in the company's policy and culture, that links health promotion to occupational health and safety and addresses systematic evaluation and maintenance plans. Also, although more factors are addressed than in our guideline, employees will still not be able to address the factors most relevant to them. These considerations may need further exploration in the occupational setting.

4. Conclusion and recommendations

Conclusion

This thesis describes that although guideline-based care led to significant improvements on sedentary behavior at the short term and on fruit intake at the short- and long term, the guideline was not able to induce favorable effects on other behavior-, body weight-, health- and work-related outcome measures. The findings as described above make clear that although the draft guideline contains best evidence and practice recommendations, these recommendations did not sufficiently enhance employee health or the quality of care. In part, this is due to issues in the research context, such as methodological, theory or

program failure. Also, this is due to issues related to the policy and practice context, such as limited support structures for continuation. Nevertheless, participant satisfaction was high and there is a broad societal basis and organizational support among stakeholders for implementing the draft guideline. The guideline is faced with the paradoxical situation that there is a need for a weight gain prevention guideline, but that the research and policy and practice context are not (yet) mature enough to effectively operationalize the guideline. I would therefore not recommend the NVAB to implement the draft guideline in its current form. Adapting the guideline would not ensure effectiveness and may exceed feasibility for routine clinical practice. To retain the knowledge gained in this thesis, a possibility is to embed successful elements of the draft guideline in the guideline on Prevention Consult for cardiometabolic risks. Before doing so, recommendations to create circumstances that may enhance the effectiveness of both initiatives should be taken into account. Considering the guideline as part of a continuous improvement cycle, I advise to address the highlighted issues regarding the research and policy and practice context. Stepping into the future, opportunities as well as challenges exist, that should be further explored and stimulated.

Recommendations

Recommendations for the NVAB considering the guideline

- Embed successful elements of the draft guideline in the, on high-risk groups oriented approach of the guideline on Prevention Consult for cardiometabolic risks
- Potential successful elements that should be further tested include; addressing the obesogenic work environment, primary prevention of overweight and obesity, and behavioral change counseling techniques

Recommendations for the stakeholders (case description)

The general introduction of this thesis poses the main question of the OP, the employer and employee: *how can weight gain be successfully prevented by a workplace health promotion program, in order to reach and maintain a healthy workforce?* Considering the above, in short I recommend the following steps.

In order to reach and maintain a healthy workforce, first a broad support basis should be created [38]. Employers and OPs could facilitate a linkage board within the company including all relevant stakeholders to monitor all steps of the innovation process (dissemination, adoption, implementation and continuation) at all implementation levels (the socio-political context, the organization, the OP and the guideline). Next, a needs assessment or risk analysis in the company will provide direction for which factors to intervene on, and direction for prevention and treatment according to stratification of employees. A health promotion plan can then be developed, in which practical circumstances are addressed such as the OPs contract, resources and how to target the programs to all stakeholders needs. Moreover, behavioral change counseling techniques can address the motivation of people to adhere to lifestyle advice as there is often no immediate consequence of unhealthy behavior, as well as to address possible resistance of employees. Finally, evaluation and maintenance should be addressed.

Recommendations for the research community

Challenges for research include;

- To make improvements regarding clear and explicit theories and methods in order to effectively achieve comprehensive workplace health promotion programs
- To study all steps of the intervention process with valid instruments and to better assess the clinical utility on the use of measuring waist circumference
- Assessing strategies to achieve sustained effectiveness of workplace health promotion programs on the longer-term, and among healthy participants with for example pricing strategies, legislation, and changes in the physical and social environment

Recommendations for policy makers

- Health at work should not be separated from general health and life, emphasizing the role and responsibilities of care providers for all health-related aspects of personal life
- Awareness should be created for ethical considerations, for example that participation is voluntary, that the independent position of the OP is maintained, and that there are no adverse consequences to participation, in order to stimulate employees to take responsibility for their own health
- Technological measures can provide key support
- Ultimately health promotion programs should be aimed at multiple individual and environmental factors, include primary, secondary and tertiary prevention, link health promotion to occupational health and safety, and pay attention to evaluation and maintenance in policy and culture
- Better educate occupational health professionals in prevention and management of chronic lifestyle-related diseases, and more specifically in behavioral change counseling techniques and physician-employer communication skills
- Develop and disseminate tools and resources for OPs to support their health and productivity management efforts
- Reevaluate the OPs position and tasks in light of the future shortage of OPs
- Combine guideline projects with an RCT. While an extensive practice test may lead to a substantial extension of the development period and costs, this may be a valuable approach in complex or relatively new topics.

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