Determinants of practice nurses' intention to implement a new smoking cessation intervention: the importance of attitude and innovation characteristics

Smit, E.S.; Hoving, C.; de Vries, H.

Link to publication

This is the pre-peer reviewed version of the following article:

**Determinants of practice nurses' intention to implement a new smoking
cessation intervention: The importance of attitude and innovation
characteristics**

Eline Suzanne Smit, MSc.[1]*, Hein de Vries, PhD[1], Ciska Hoving, PhD[1]

[1]Department of Health Promotion, Maastricht University/School for Public Health and Primary
Care (CAPHRI), P.O. Box 616, 6200 MD Maastricht, the Netherlands
*Corresponding author; es.smit@maastrichtuniversity.nl

Word count abstract: 244

Word count main text: 3646

ABSTRACT

Aims To identify determinants of practice nurses' intention to implement a new smoking cessation intervention and to investigate the independent value of attitude and Rogers' innovation characteristics.

Background While effective smoking cessation interventions exist, implementation is often suboptimal. No previous studies have disentangled the independent value of beliefs towards implementation and innovation characteristics in explaining implementation.

Methods In 2010, 56 of 91 general practice nurses who participated in an intervention effectiveness trial completed an online questionnaire concerning demographics, patient population characteristics, attitude, innovation characteristics, self-efficacy, perceived social influence and intention to implement the intervention in the future. Recruitment success during the trial was defined as the number of patients participating. To detect differences between intending and non-intending practice nurses, independent sample T-tests and Chi-square tests were conducted. Correlation coefficients were calculated to identify associations between potential determinants of intention. To identify significant determinants logistic hierarchical regression analyses were conducted.

Results Innovation characteristics (OR 73.38; 95% CI 2.09-2580.61) and attitude (OR 38.37; 95% CI 1.23-1196.01) were both significantly associated with practice nurses' intention to implement. While recruitment success showed a significant positive association with intention (OR 1.38; 95% CI 1.09-1.75), perceived patient support was only a significant determinant when including innovation characteristics or attitude.

Conclusion To increase new interventions' implementation rates, it is most important to convince health professionals of its beneficial characteristics, to generate a positive attitude towards the intervention, to aid practice nurses in recruiting smoking patients and to increase perceived patient support.

SUMMARY STATEMENT

What is already known about this topic

- Effective nurse-led smoking cessation interventions have been developed.

- The implementation of such interventions in practice is often suboptimal.

- While previous implementation studies have tried to integrate the I-Change model with Rogers' Diffusion of Innovations theory, none have disentangled the independent value of attitude and Rogers's innovation characteristics in explaining implementation.

What this paper adds

- Innovation characteristics were most strongly, positively associated with the intention to implement.

- While correlated with innovation characteristics, attitude appeared to show an independent, positive association with intention as well.

- Recruitment success and perceived patient support during a trial period were positively associated with the intention to implement.

Implications for practice

- Convincing health professionals of a new smoking cessation intervention's beneficial characteristics as well as generating a positive attitude towards the intervention might be helpful in increasing implementation rates.

- Additionally, helping practice nurses in successfully recruiting smoking patients and increasing practice nurses' perceived patient support might be associated with increased rates of implementation.

KEYWORDS

Implementation; intervention; smoking cessation; attitude; innovation characteristics; practice nurses; primary care

INTRODUCTION

Smoking is the most preventable cause of illness and premature death in the world (USDHHS, 2004, WHO, 2008). Five million people are dying from tobacco use each year (WHO, 2008), which stresses the importance of smoking cessation. Within the Dutch primary care setting, smoking cessation counseling is most often provided by practice nurses (Nederlands Huisartsen Genootschap and Landelijke Huisartsen Vereniging, 2011). In the Netherlands, practice nurses have an intermediate level of vocational education, qualifying them to provide the care for patients with chronic diseases such as diabetes, asthma or hypertension, for whom smoking cessation is of extra importance, within the primary care setting (Nederlands Huisartsen Genootschap and Landelijke Huisartsen Vereniging, 2011). Previously, primary care professionals in general have been shown to be successful in promoting smoking cessation among their patients (Lancaster et al., 2000, Stead et al., 2008) and reasonable evidence exists that nurse-delivered smoking cessation interventions are effective (Rice and Stead, 2008). The public health impact of these interventions, however, is not only dependent on their effect, but also on their reach (Velicer and Prochaska, 1999, de Vries and Brug, 1999, Glasgow et al., 1999), while the implementation of these programmes is often suboptimal (Eccles et al., 2007, Glasgow et al., 2003, Stead et al., 2009). This results in lower cessation rates than ideally possible. To obtain higher smoking cessation rates, it is therefore important to study the cognitive factors associated with the implementation of smoking cessation interventions in practice.

Background

In previous studies addressing the determinants of the implementation of health behaviour change interventions, socio-cognitive theories such as the I-Change model (De Vries et al., 2003) as well as the Diffusion of Innovations theory (Rogers, 1995) have been frequently applied (Lee, 2004, Pronk et al., 2001, Rogers, 2002, van der Weide and Smits, 2004, Helmink et al., 2011, Hoving et al., 2007, Puffer and Rashidian, 2004). According to the I-Change model, implementation is determined by the intention to implement, which is determined by three cognitive factors: attitude, social influence and self-efficacy (De Vries et al., 2003). Previous studies indeed showed that health professionals' clinical behaviour could

6

be largely explained by their intention (Eccles et al., 2006), while a positive attitude, positive social norms and a higher self-efficacy have previously been associated with the intention to implement smoking cessation programmes in practice (Hoving et al., 2007, Puffer and Rashidian, 2004, Helmink et al., 2011). These three motivational factors, in turn, are predicted by several predisposing factors, such as practice nurses' own smoking status and their training in giving smoking cessation advice (Hall et al., 2005, Stead et al., 2009).

The Diffusion of Innovations theory (Rogers, 1995) suggests that the decision to implement a new intervention is a process that occurs over time and consists of multiple phases: knowledge, persuasion, decision, implementation and confirmation (Rogers, 1995). Health professionals first need to be aware of the intervention's existence, then form a favourable or unfavourable attitude towards the intervention, decide to adopt or reject the intervention, start implementing it and ultimately seek reinforcement of the decision made. Within this process, the attitude towards the intervention is assumed to be based on the perception of five intervention characteristics (i.e. relative advantage, compatibility, complexity, trialability and observability) (Rogers, 1995), which have previously been shown to be related to the implementation of preventive interventions in general (Lee, 2004, Pronk et al., 2001, Rogers, 2002) and smoking cessation interventions in particular (Segaar et al., 2006, Segaar et al., 2007, Bolman et al., 2002).

Previous implementation studies have tried to integrate Rogers' innovation characteristics within the socio-cognitive concept of attitude (Bolman et al., 2002, Segaar et al., 2007). In these studies, differences were found between cardiac nurses adhering and non-adhering to a minimal-contact smoking cessation intervention regarding all innovation characteristics (Segaar et al., 2007) and between cardiac nurses intending and non-intending to continue using this intervention regarding the interventions' perceived advantage and complexity (Bolman et al., 2002). While both studies considered Rogers' innovation characteristics as part of the more general construct of attitude, previous studies of the implementation of innovations in health care have considered attitude to be a characteristic of the intervention's user (i.e. the health professional) and Rogers' concepts as characteristics of the intervention(Fleuren et al., 2004, Helmink et al., 2011). Considering attitude and innovation characteristics as two separate constructs, would lead to our hypothesis that both

7

are independently associated with the intention to implement and that including both constructs separately into the same model explaining the intention to implement would lead to more explained variance than including either of the two constructs alone. Yet, to our knowledge, no studies have been conducted that disentangled the independent value of attitude and Rogers's innovation characteristics in explaining the implementation of smoking cessation interventions in practice, while this would provide more specific targets for developing intervention strategies aimed at increasing implementation rates and, consequently, for increasing smoking cessation rates.

THE STUDY

Aims

This paper is a report of a study that aimed to identify determinants of Dutch practice nurses' intention to implement a new smoking cessation intervention after an initial trial period and to investigate the relative value of attitude and Rogers's innovation characteristics, next to other cognitive factors as derived from the I-Change Model, in explaining the intention to implement this intervention in the general practice setting. The present study was part of the process evaluation of a larger randomized controlled trial (RCT) testing the effectiveness of the smoking cessation intervention PAS (Personal Advice in Stopping smoking) amongst a sample of smokers recruited via practice nurses.

Design

A cross-sectional study was conducted.

Sample/participants

A sample size calculation was conducted to calculate the number of smokers required for the RCT; this sample size calculation is described elsewhere (Smit et al., 2010). Based on this power calculation, we aimed to include around 1200 smokers and at least 80 practice nurses. In June and July 2010, all 91 Dutch general practice nurses who participated in the RCT were invited by e-mail to fill out an online questionnaire about their experiences with PAS and their

8

intention to implement PAS in the future. PAS is a smoking cessation intervention consisting of a web-based computer-tailored smoking cessation program, providing multiple tailored feedback letters, and tailored counseling by a practice nurse. From May 2009 to June 2010, these practice nurses offered PAS to their smoking patients, which resulted in a total of 414 smokers taking part in the trial. A more detailed description of the intervention and of the PAS study design is provided elsewhere (Smit et al., 2010).

Data collection

The online questionnaire consisted of 61 questions and was based on previously developed questionnaires that used the I-Change model (De Vries et al., 2003) and/or Rogers's Diffusion of Innovations theory (Rogers, 1995) as a theoretical framework for studying the intention to implement a smoking cessation programme among general practice staff (Bolman et al., 2002, Leitlein et al., 2011, Hoving et al., 2007).

Practice nurses´ smoking status (smoking/non-smoking) was assessed, as well as whether they used smoking cessation guidelines before their participation in the trial (yes/no). In addition, respondents were asked to describe their perception of their patient population in terms of age (estimated majority young/neutral/old), smoking status (estimated majority smoking/neutral/non-smoking), nationality (estimated majority Dutch/neutral/non-Dutch), educational level (estimated majority low/neutral/high). Recruitment success was defined as the total number of patients in each general practice who participated in the RCT, information known by the research team.

Furthermore, the questionnaire included questions to assess practice nurses' attitude, Rogers' innovation characteristics, social influence, self-efficacy and their intention to implement PAS in the future. Unless stated otherwise, all items described in the following were assessed on a five-point Likert scale (1=totally disagree; 5=totally agree).

Attitude towards the intervention was measured with three items, i.e. 'PAS is an effective smoking cessation intervention', ´The Internet is a good medium to aid patients to quit smoking´, 'I think that, when combined with a web-based programme, one counselling session with a practice nurse should be sufficient to aid smoking patients to quit'.

Rogers' innovation characteristics were assessed by four items, i.e. ´PAS is an improvement compared with our previous smoking cessation activities´ (relative advantage), ´PAS fits within the current way of working in our general practices´ (compatibility), ´It was complicated to use PAS in our general practice´ (complexity) and ´The use of PAS is beneficial for the general practice's reputation´ (observability). Before inclusion in the subscale, the item on complexity was reversed. Trialability was not assessed as all respondents already had a trialability opportunity when participating in the RCT.

Self-efficacy was measured with one item, i.e. 'I found it difficult to conduct a counselling session using the PAS counselling protocol'.

Social influence was measured with two items, assessing whether colleagues stimulated the use of PAS and whether patients were supportive of its use.

The intention to implement PAS in the future was measured by one question: 'Whenever PAS becomes nationally available, would you intend to use it in your general practice?' (1=definitely yes; 5=definitely not).

Ethical considerations

The study was approved by the Medical Ethics Committee of Maastricht University and the University Hospital Maastricht (MEC 08-3-037; NL22692.068.08), and is registered with the Dutch Trial Register (NTR1351).

Data analysis

All analyses were conducted with SPSS version 17.0.

First, respondents were divided into two groups based on their intention to implement the intervention: intenders (definitely yes, probably) and non-intenders (definitely no, probably not, maybe). Independent sample T-tests and Chi-square tests were conducted to detect differences between intenders and non-intenders with regard to demographics, patient characteristics, recruitment success, attitude, perceived innovation characteristics, social influence and self-efficacy.

Secondly, to identify associations between potential determinants of the intention to implement Pearson's correlation coefficients were calculated for pairs of continuous variables

and for pairs of a dichotomous and a continuous variable (Field, 2005). Spearman's correlations were calculated for pairs of an ordinal and a continuous/dichotomous variable (Field, 2005).

Thirdly, hierarchical logistic regression analyses were conducted. We tested three models: 1) a model with concepts from the I-Change model only; 2) a model with concepts from the I-Change model, in which attitude was replaced by Rogers' innovation characteristics; 3) a model with concepts from the I-Change model, including attitude, and Rogers' innovation characteristics. Predisposing factors on both health professional and patient level (i.e. health professionals' smoking status, use of existing smoking cessation guidelines, recruitment success, and the perceived age and educational level of the patient population) were entered into each model first. As this first step was of exploratory nature, we used a backward approach (Field, 2005), whereby variables were excluded from the model based on the likelihood ratio statistic (LR). In the second step, attitude and/or Rogers' innovation characteristics, self-efficacy and social influence were added into the model using the Enter method.

Validity and reliability

The Cronbach's alpha's found for the three items measuring the construct of attitude and for the four items measuring Roger's innovation characteristics were .59 and .66, respectively. While these Cronbach's alpha's might appear low, these are not extraordinary when measuring psychological constructs with only few items (Field, 2005). For social influence no reliable scale could be constructed; therefore, both measures were taken into account separately in all analyses.

RESULTS

Sample characteristics

In total, 61 practice nurses filled out our questionnaire (67% response rate). Of these 61 practice nurses, 56 completed the question about their intention to implement the intervention and were thus included in the data analysis. Twenty-one (37.5%) practice nurses could be

categorized as intenders and 35 (62.5%) as non-intenders. A small minority of practice nurses reported to currently smoke (6.5%), while most practice nurses reported to use existing smoking cessation guidelines (91.4%). On average, practice nurses recruited seven smokers for participation in the RCT (range 0-26).

Differences between intenders and non-intenders

Table 1 provides a detailed description of intending and non-intending practice nurses' characteristics. T-tests and Chi-square test revealed that practice nurses intending to implement reported a significantly higher percentage of younger patients within their patient population. Moreover, they reported significantly less often to have used smoking cessation guidelines than non-intending practice nurses. Those intending to use the PAS intervention if it became nationally available had recruited more patients during the trial period (average of 10.4 patients) than had non-intenders (average of 4.5 patients). Furthermore, the attitude towards PAS of intenders was significantly more positive and they valued the intervention significantly higher with regard to Rogers' characteristics. Furthermore, perceived patient support and the level of self-efficacy were significantly higher among intenders than among non-intenders.

Correlations between potential determinants of the intention to implement

The correlation matrix in table 2 shows the correlations between all measured determinants of the intention to implement. The patient population's age was negatively related to attitude, while Rogers' innovation characteristics and perceived patient support were both positively related to attitude. Rogers' innovation characteristics were also positively associated with self-efficacy and perceived patient support, while recruitment success showed a positive association with perceived social influence from both colleagues and patients.

Determinants of the intention to implement

Two of the predisposing factors remained in the model: practice nurses' use of smoking cessation guidelines and recruitment success. Both were significantly associated with the intention to implement the intervention (use of guidelines: OR 12.70; 95% CI 1.07-150.60;

recruitment success: OR 1.22; 95% CI 1.07-1.40). Practice nurses who already used smoking cessation guidelines and those who had recruited more patients were more likely to intend to implement than practice nurses who did not yet use guidelines or who had recruited fewer patients. These two factors were added into each second model tested.

In the model with predisposing factors and concepts from the I-Change model, attitude was positively associated with the intention to implement, as was the perceived social support from patients. In addition, the positive association between recruitment success and intention to implement remained significant.

In the model with predisposing factors and concepts from the I-Change model, but with attitude replaced by Rogers' innovation characteristics, innovation characteristics showed a significant positive association with the intention to implement. Again, the perceived social support from patients was found to be positively associated with the intention to implement, while the positive association between recruitment success and the intention to implement again remained significant.

In the model with concepts from the I-Change model and Rogers' innovation characteristics, both attitude and innovation characteristics were found to be positively associated with the intention to implement. While the positive association between recruitment success and the intention to implement again remained significant, the association between perceived social support from patients and the intention to implement became non-significant. All three models are presented in table 3.

DISCUSSION

The present study is the first that disentangled the independent value of attitude and innovation characteristics in explaining the intention to implement a new smoking cessation intervention in the general practice setting after an initial trial period. It was suggested that, even though Rogers' innovation characteristics were more strongly associated with intention, both constructs were of independent importance in explaining practice nurses' intention to implement. Furthermore, our findings indicate that recruitment success was positively associated with the intention to implement the intervention. Another factor that seemed to

13

determine practice nurses' intention to implement was perceived social support from patients. However, the positive association found became non-significant when both innovation characteristics and attitude were taken into account.

Although causality could not be established within our cross-sectional study, findings suggest that, to increase implementation rates, it is of foremost importance to convince health professionals of a new intervention's beneficial characteristics. Implementation rates might be even further increased by generating a positive attitude towards the intervention. Within the present study, practice nurses were informed about the new intervention by the research team. The I-Change Model suggests that the source of the message is an important predictor of attitude (De Vries et al., 2003). Similarly, Rogers suggests that the use of champions might facilitate the dissemination of preventive interventions (Rogers, 2002). To increase a positive attitude towards implementation, it may thus be useful to also explore the potential of using peers i to disseminate information about a new intervention for practice nurses, such as the general practitioners they are working for or the general practice management. Furthermore, a previous study showed that practice nurses' satisfaction with their current smoking cessation activities was negatively associated with their intention to adopt a new smoking cessation intervention (Leitlein et al., 2011). Conceivably, practice nurses based their attitude towards implementation of the intervention on their satisfaction with the intervention during the initial trial period (i.e. the RCT). It would thus be interesting to assess the role satisfaction plays in determining implementation.

In line with a previous study (Hoving et al., 2007), practice nurses who were more successful in recruiting patients during the RCT reported a higher intention to implement the intervention than those who were less successful. Within our RCT, all participating practice nurses were provided with many recruitment materials, such as desk displays, recruitment letters, business cards, recruitment texts for their websites and posters to help them to recruit smoking patients (Smit et al., 2010). Moreover, incentives were sent to practice nurses after recruiting five and ten patients. Still, however, not all practice nurses were able to recruit smoking patients to participate in the RCT testing the intervention's effectiveness. The positive correlation found between perceived social support from colleagues and recruitment success suggests that practice nurses who experienced more support from their colleagues

were more successful in recruiting smoking patients. However, both intending and non-intending practice nurses scored relatively low on the perceived support from colleagues, i.e. lower than three on a five-point scale. Here thus seems to be room for improvement. As a previous study showed that a more active role of general practice staff resulted in a higher intention to implement a smoking cessation expert system (Hoving et al., 2007), a more active involvement of the GP or physician assistant with in the recruitment process might be a strategy to increase recruitment rates and to ultimately increase the intention to implement the intervention in the general practice. Another possibility for relatively low rates of recruitment might be that smoking patients were not willing to quit smoking. This possibility warrants further exploration in future studies.

More perceived patient support also turned out to be associated with a positive intention to implement, yet only when taking into account innovation characteristics or attitude. Nevertheless, creating more perceived patient support might be a strategy to boost practice nurses' intention to implement. As in the present study both intending and non-intending practice nurses did not experience much support from their patients, there appears to be room for improvement. One possibility to increase perceived patient support might be to disseminate testimonials of patients describing their positive experiences with the intervention among health professionals via regular e-newsletters or a study website. In addition, more intensive involvement of patient organizations in the development of the intervention and explicitly showing their involvement to practice nurses (e.g. in promotion materials), may be another strategy that could further stimulate implementation (Rogers, 2002). This may give practice nurses the idea that (their) patients approve of the intervention, leading to more perceived patient support.

Limitations

In the study, some limitations were present. First, the study was of cross-sectional nature. Therefore, we were unable to draw conclusions about the causality of the associations found. A related limitation is that the study was relatively underpowered to conduct regression analyses due to the relatively small sample size. This is demonstrated by several wide confidence intervals and might have led to the final model over fitting the data. While the

results presented should thus be interpreted with caution, they can be valuable in guiding future longitudinal studies with larger samples of practice nurses.

Secondly, the study was conducted amongst Dutch practice nurses who participated in a trial testing the effectiveness of a new smoking cessation intervention developed in the Netherlands. As all participating practice nurses had yet agreed to adopt the intervention for the effectiveness trial period, these practice nurses might have viewed the intervention more positive than the average Dutch practice nurse would have. In line with a previous study, however, we would expect the differences between intenders and non-intenders as presented in this manuscript to be even more profound when all Dutch practice nurses would have participated (Hoving et al., 2007).

Thirdly, we were unable to study the determinants of actual implementation of the intervention as it was not yet nationally available. A systematic review by Eccles and colleagues (2006), however, showed intention to be an important predictor of health professionals' clinical behaviour, explaining a similar proportion of the variance in behaviour found in literature among non-health professionals (Eccles et al., 2006). The intention to implement can therefore be considered a reliable precursor of actual implementation. Lastly, self-efficacy was measured with one item only, which is not a reliable measure of the construct. Within the present study, we aimed to minimize practice nurses' burden of filling out the questionnaire, but future studies should aim to assess self-efficacy with at least three items.

CONCLUSION

The present study is the first that showed that both attitude and innovation characteristics were important in explaining practice nurses' intention to implement a new smoking cessation intervention in the general practice setting. Recruitment success and perceived support from patients were also both suggested to be significant determinants of the intention to implement. To increase implementation rates of new smoking cessation interventions, it might thus not only be important to convince health professionals of the beneficial characteristics of a new intervention, but also to generate a positive attitude towards the intervention. This

process can be enhanced by involving general practitioners and other members of the general practice's team in dissemination and recruitment processes, Furthermore, since perceived patient support is also suggest to be of importance, it is recommended to make this support salient, for instance by disseminating patients' positive experiences with the intervention via testimonials.

LIST OF ABBREVIATIONS

RCT   Randomized Controlled Trial

PAS   Personal Advice in Stopping smoking

COMPETING INTERESTS

Hein de Vries is scientific director of Vision2Health, a company that licenses evidence-based innovative computer-tailored health communication tools.

AUTHORS' CONTRIBUTIONS

CH and HdV developed the concept and design of the study. ESS designed the questionnaires, coordinated the RCT towards the effectiveness of the intervention and collected data for the present study. HdV and CH provided support during the development of intervention materials and execution of the studies. ESS and CH significantly contributed to writing this manuscript, while HdV was involved in revising the manuscript. All authors have read and approved the final version of the manuscript.

ACKNOWLEDGEMENTS

study design, the collection, analysis and interpretation of the data, the writing of the report, or in the decision to submit the paper for publication.

REFERENCES

BOLMAN, C., DE VRIES, H. & MESTERS, I. 2002. Factors determining cardiac nurses' intentions to continue using a smoking cessation protocol. *Heart & Lung,* 31**,** 15-24.

DE VRIES, H. & BRUG, J. 1999. Computer-tailored interventions motivating people to adopt health promoting behaviours: introduction to a new approach. *Patient Education and Counseling,* 36**,** 99-105.

DE VRIES, H., MUDDE, A., LEIJS, I., CHARLTON, A., VARTIAINEN, E., BUIJS, G., CLEMENTE, M. P., STORM, H., GONZALEZ NAVARRO, A., NEBOT, M., PRINS, T. & KREMERS, S. 2003. The European Smoking prevention Framework Approach (EFSA): an example of integral prevention. *Health Education Research,* 18**,** 611-626.

ECCLES, M. P., HRISOS, S., FRANCIS, J., KANER, E. F., DICKINSON, H. O., BEYER, F. & JOHNSTON, M. 2006. Do self- reported intentions predict clinicians' behaviour: a systematic review. *Implementation Science,* 1**,** 28.

ECCLES, M. P., JOHNSTON, M., HRISOS, S., FRANCIS, J., GRIMSHAW, J., STEEN, N. & KANER, E. F. 2007. Translating clinicians' beliefs into implementation interventions (TRACII): a protocol for an intervention modeling experiment to change clinicians' intentions to implement evidence-based practice. *Implementation Science,* 2**,** 27.

FIELD, A. 2005. *Discovering statistics using SPSS,* London, SAGE Publications Ltd.

FLEUREN, M., WIEFFERINK, K. & PAULUSSEN, T. 2004. Determinants of innovation within health care organizations: literature review and Delphi study. *International Journal for Quality in Health Care,* 16**,** 107-23.

GLASGOW, R. E., LICHTENSTEIN, E. & MARCUS, A. C. 2003. Why don't we see more translation of health promotion Research to Practice? Rethinking the Efficacy-to-Effectiveness Transition. *American Journal of Public Health,* 93**,** 1261-1267.

GLASGOW, R. E., VOGT, T. M. & BOLES, S. M. 1999. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health,* 89**,** 1322-7.

HALL, S., VOGT, F. & MARTEAU, T. M. 2005. A short report: survey of practice nurses' attitudes towards giving smoking cessation advice. *Family Practice,* 22**,** 614-6.

HELMINK, J. H., KREMERS, S. P., VAN BOEKEL, L. C., VAN BRUSSEL VISSER, F. N. & DE VRIES, N. K. 2011. Factors determining the motivation of primary health care professionals to implement and continue the 'Beweegkuur' lifestyle intervention programme. *Journal of Evaluation in Clinical Practice*.

HOVING, C., MUDDE, A. N. & DE VRIES, H. 2007. Intention to implement a smoking cessation expert system in Dutch general practice. *Health Education,* 107**,** 307-315.

LANCASTER, T., STEAD, L., SILAGY, C. & SOWDEN, A. 2000. Effectiveness of interventions to help people stop smoking: findings from the Cochrane Library. *British Medical Journal,* 321**,** 355-358.

LEE, T. T. 2004. Nurses' adoption of technology: application of Rogers' innovation-diffusion model. *Applied Nursing Research,* 17**,** 231-8.

LEITLEIN, L., SMIT, E. S., DE VRIES, H. & HOVING, C. 2011. Factors influencing Dutch practice nurses' intention to adopt a new smoking cessation intervention. *Journal of Advanced Nursing,* Accepted for publication.

NEDERLANDS HUISARTSEN GENOOTSCHAP & LANDELIJKE HUISARTSEN VERENIGING 2011. NHG/LHV-Standpunt: Het (ondersteunend) team in de huisartsenvoorziening. Utrecht.

PRONK, M. C., BLOM, A. T., JONKERS, R. & VAN BURG, A. 2001. The diffusion process of patient education in Dutch community pharmacy: an exploration. *Patient Education and Counseling,* 42**,** 115-21.

PUFFER, S. & RASHIDIAN, A. 2004. Practice nurses' intentions to use clinical guidelines. *Journal of Advanced Nursing,* 47**,** 500-9.

RICE, V. H. & STEAD, L. F. 2008. Nursing interventions for smoking cessation. *Cochrane Database of Systematic Reviews***,** Cd001188.

ROGERS, E. M. 1995. *Diffusion of Innovations,* New York, Free Press.

ROGERS, E. M. 2002. Diffusion of preventive innovations. *Addictive Behaviors,* 27**,** 989-993.

SEGAAR, D., BOLMAN, C., WILLEMSEN, M. C. & DE VRIES, H. 2006. Determinants of adoption of cognitive behavioral interventions in a hospital setting: Example of a minimal-contact smoking cessation intervention for cardiology wards. *Patient Education and Counseling,* 61**,** 262-271.

SEGAAR, D., WILLEMSEN, M. C., BOLMAN, C. & DE VRIES, H. 2007. Nurse adherence to a minimal-contact smoking cessation intervention on cardiac wards. *Research in Nursing & Health,* 30**,** 429-44.

SMIT, E. S., DE VRIES, H. & HOVING, C. 2010. The PAS study: a randomized controlled trial evaluating the effectiveness of a web-based multiple tailored smoking cessation programme and tailored counselling by practice nurses. *Contemporary Clinical Trials,* 31**,** 251-8.

STEAD, L. F., BERGSON, G. & LANCASTER, T. 2008. Physician advice for smoking cessation. *Cochrane Database of Systematic Reviews***,** Cd000165.

STEAD, M., ANGUS, K., HOLME, I., COHEN, D. & TAIT, G. 2009. Factors influencing European GPs' engagement in smoking cessation: a multi-country literature review. *British Journal of General Practice,* 59**,** 682-90.

USDHHS 2004. *The health consequences of smoking: a report of the Surgeon General,* Washington, D.C., Department of Health and Human Services, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

VAN DER WEIDE, M. & SMITS, J. 2004. Adoption of innovations by specialised nurses: personal, work and organisational characteristics. *Health Policy,* 68**,** 81-92.

VELICER, W. F. & PROCHASKA, J. O. 1999. An expert system intervention for smoking cessation. *Patient Education and Counseling,* 36**,** 119-29.

WHO 2008. WHO Report on the Global Tobacco Epidemic, 2008: the MPOWER package. Geneva: World Health Organization.

Table 1. Characteristics of intending and non-intending practice nurses (N=56)

	Intending practice nurses (N=21)	Non-intending practice nurses (N=35)	T	X²	p-value
Smoking status					
% non-smokers	95.2	94.3		.02	.88
Use of smoking cessation guidelines					
% using no guidelines	19.0	2.9		4.23	**.04**
Perceived patient population					
majority of patients young	23.8	5.7		6.13	**.047**
majority of patients smoking	9.5	11.4		.10	1.0
majority of patients Dutch	66.7	80.0		2.74	.25
majority of patients highly educated	9.5	11.4		.16	.92
Number of patients recruited	10.4; 7.2	4.5; 4.6	-3.36		**<.00**

23

Attitude (Mean; S.D.) [a]	3.4; .5	2.9; .5	-4.30	**<.00**
Innovation characteristics (Mean; S.D.) [a]	3.5; .3	2.8; .5	-5.63	**<.00**
Self-efficacy (Mean; S.D.) [a]	4.0; .6	3.4; 1.0	-2.90	**.01**
Social influence				
Colleagues (Mean; S.D.) [a]	2.9; .9	2.6; .7	-.89	.38
Patients (Mean; S.D.) [a]	3.2; .6	2.4; .7	-4.54	**<.00**

Note: [a] range from 1-5; significant differences are depicted in bold.

Table 2. Correlation matrix

	Smoking status	Use of existing guidelines	Patients' age	Patients' education	Recruitment success	Attitude	Innovation characteristics	Self-efficacy	Social influence – colleagues	Social influence - patients
Smoking status	1.00	.07	.00	-.05	-.09	-.04	-.04	.09	-.09	-.01
Use of existing guidelines		1.00	.21	.10	.03	-.16	-.21	-.19	-.04	-.12
Patients' age			1.00	-.03	-.06	-.28*	-.25	-.11	.19	-.07
Patients' education				1.00	-.08	-.06	-.06	-.09	-.23	.07

	Recruitment success	Attitude	Innovation characteristics	Self-efficacy	Social support – colleagues	Social support – patients
Recruitment success	1.00					
Attitude	.08	1.00				
Innovation characteristics	.25	.44**	1.00			
Self-efficacy	.25	.24	.43**	1.00		
Social support – colleagues	.43**	-.20	.19	-.04	1.00	
Social support – patients	.29*	.47**	.49**	.20	.17	1.00

Note: $*p<.05$; $**p<.01$.

Table 3. Results from logistic regression analyses aimed to identify determinants of practice nurses' (N=56) intention to implement PAS in the future[a]

	I-Change - attitude			I-Change - innovation characteristics			I-Change - attitude and innovation characteristics		
	$R^2=.69$			$R^2=.73$			$R^2=.80$		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper
Use of guidelines[b]	14.79	.75	290.04	16.79	.33	861.58	46.73	.23	9610.23
Recruitment success	1.27*	1.06	1.52	1.27*	1.05	1.54	1.38**	1.09	1.75
Attitude	19.43*	1.78	212.13	-	-	-	38.37*	1.23	1196.01
Innovation characteristics	-	-	-	41.20**	3.10	548.44	73.38*	2.09	2580.61
Self-efficacy	1.11	.40	3.08	1.88	.52	6.83	3.35	.72	15.72
Social support									
Colleagues	.83	.29	2.41	.56	.16	1.93	.89	.20	3.90
Patients	6.26*	1.12	34.85	7.54*	1.22	46.81	17.39	.52	583.92

Note: [a]Assessed as 'Whenever PAS becomes nationally available, would you intend to use it in your general practice?' (1=definitely yes, probably; 0=definitely no, probably not, maybe); [b]Reference category no use of guidelines; *p<.05; **p<.01.