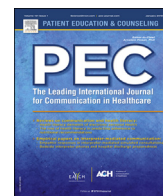




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Determinants of providing smoking cessation care in five groups of healthcare professionals: A cross-sectional comparison

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ABSTRACT

Objective To investigate implementation of a tobacco dependence treatment guideline among five groups of healthcare professionals.

Methods Data collected in The Netherlands (2016–2017) were compared among gynaecologists (N=49), midwives (N=68), respiratory nurses (N=72), practice nurses (N=84) and paediatricians (N=38). Intentions to use the guideline, satisfaction with own implementation, and dosage delivered of quit-advice and assisting in quitting were predicted using linear regression analyses and regression tree analyses.

Results Implementation of smoking cessation care (SCC) and barriers differed between the groups, with nurses reporting better implementation and fewer barriers. Main barriers were lacking training (gynecologists, pediatricians) and time (midwives). Regression tree analyses showed that self-efficacy and training interacted; participants with weaker self-efficacy provided more quit advice if they had participated in SCC training. Training was positively related to intentions to use the guideline, satisfaction, providing quit-advice, and assisting smokers in quitting.

Conclusion Implementation of SCC is suboptimal, such that patients who smoke do not receive the highest quality of care. Profession and training in SCC are important determinants of implementation of SCC.

Practice implications Efforts to improve implementation should be targeted at profession. Training is indicated, and may focus on skills for nurses, and knowledge for gynecologists, midwives and pediatricians.

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1. Introduction

Smoking increases the risk of many serious diseases [1]. Despite efforts to reduce smoking prevalence, smoking is still a major public health concern [2,3]. Healthcare professionals (HCPs) can make an important contribution to improving smokers' health, as well as the health of people around smokers. However, smoking cessation guidelines are not (optimally) implemented in daily practice in The Netherlands [4–10] and many other countries [11–18]. This results in lower quality of care, higher health care expenditures, and worse patient outcomes. The consolidated framework for implementation research states that the implementation of interventions depends on factors related to the intervention itself, the 'inner and outer setting' in which the intervention resides, the HCP, and the implementation process

[19]. Research into smoking cessation care (SCC) supports this classification [7–9,12,15,16,20–24]. Amongst other factors, lack of time and patient or professional reimbursement are important barriers to implementation of SCC, as well as HCPs' beliefs that patients are unmotivated to quit. On the level of the HCP, relevant factors include negative outcome expectancies, lack of training, own smoking history, and self-efficacy. Factors are likely to differ between HCP groups, e.g. midwives appear more concerned that SCC negatively impacts the relationship with their patient than general practitioners [5,22]. In addition, many theoretical frameworks focus mainly on 'intrinsic' characteristics of guidelines such as format in explaining whether guideline implementation succeeds [25–28]. No consensus has been reached on which factors are key.

This study extends previous work by including and comparing five different groups of HCPs from primary and secondary care: gynecologists, midwives, nurses working in general practice, respiratory nurses, and pediatricians. Although SCC is relevant to other HCP groups, these groups can contribute strongly to a

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trans-generational approach to decreasing smoking prevalence; from preventing fetal exposure to smoking, to helping adolescent and adult smokers quit smoking successfully. This study adds knowledge that is relevant to the ‘Smokefree generation movement’ in The Netherlands, which aims to create an environment in which children are no longer exposed to tobacco smoke. Previous work also typically examined linear relations between determinants and outcomes. This study adds to the literature by assessing whether determinants interact, using regression tree analysis as an advanced statistical technique. We examined the following research questions in relation to the Dutch tobacco dependence treatment guideline [29]:

- To what extent do HCPs implement the guideline (RQ1)?
- Which barriers to using the guideline do HCPs encounter, and do barriers differ between disciplines (RQ2)?
- Are intentions to use the guideline and guideline implementation (satisfaction; dosage delivered, RQ3) related to HCP characteristics and barriers, and to what extent do these factors interact in predicting intentions and guideline implementation (RQ4)?

2. Method

2.1. Design

This study is part of a longitudinal study, which evaluated a digital messaging-based tool to improve guideline implementation. The larger study consisted of baseline assessment (T1), and two-month and eight-month follow-ups (T2,T3). The current study focuses on T1.

2.2. Participants

We included 49 gynecologists, 68 midwives, 38 pediatricians, 84 practice nurses, and 72 respiratory nurses (55 and 17 specialized in adults and children, respectively), $N=311$. Gynecologists were added on request of their professional association (Table 1 for recruitment).

2.3. Procedure

Data were collected in The Netherlands between December 2016 and September 2017. Before entering the online questionnaire (www.qualtrics.com) participants were informed online that participation was voluntarily and that data would be analyzed anonymously and treated confidentially, and were asked for consent. Participants were directed to the first questionnaire after consent, or informed that they could not participate without consent. Median time needed to complete the questionnaire was 19 min. Three gift coupons of €100.- and six of €50.- were randomly distributed among participants who completed T1–T3. Participants who were registered as smoking cessation coaches could receive accreditation points for participation. The procedure was cleared for ethics by [removed for blind review].

2.4. Measures

The selection and operationalization of variables was based on previous work [8,12,17,20,30–33]. Variables had no missing values, except for dosage delivered.

2.4.1. Predictor variables

2.4.1.1. Participant and patient characteristics. Participants provided gender, year of birth, profession, years worked as professional, previous participation in SCC training, smoking status (never smoker/ex-smoker/current smoker), and proportion of their patients who were smokers (%).

2.4.1.2. Barriers to guideline usage. Participants indicated to what extent ten pre-specified factors were barriers to guideline usage, with answer categories [1] ‘not at all’ [2], ‘not’ [3], ‘a little’ [4], ‘slightly’ [5], ‘strongly’. Six barriers were measured among all groups (guideline adaptability, guideline complexity, time, materials, patient reimbursement from healthcare insurance companies (for counseling costs and/or medication), referral possibilities, SCC training), and four additional items were specific to HCP group (based on literature). Participants who

Table 1

Participant and patient background characteristics, and recruitment method per HCP group.

Variable	Category	n (%) / M (SD)				
		Gynecologists (n=49)	Midwives (n=68)	Pediatricians (n=38)	Practice nurses (n=84)	Respiratory nurses (n=72)
Participant characteristics						
Age		42.45 (9.97)	41.16 (11.65)	46.84 (7.94)	49.04 (9.63)	50.29 (8.40)
Gender	Female	36 (74%)	67 (99%)	27 (71%)	81 (96%)	70 (97%)
	Male	13 (27%)	1 (1%)	11 (29%)	3 (4%)	2 (3%)
Years worked		8.57 (7.94)	16.50 (11.43)	13.36 (7.83)	8.33 (4.45)	11.42 (6.31)
SCC training	No	47 (96%)	13 (19%)	25 (66%)	6 (7%)	10 (14%)
	Yes	2 (4%)	55 (81%)	13 (34%)	78 (93%)	62 (86%)
Smoking status	Never	34 (69%)	51 (75%)	30 (79%)	53 (63%)	38 (53%)
	Ex-smoker	12 (25%)	10 (15%)	6 (16%)	27 (32%)	34 (47%)
	Current	3 (6%)	7 (10%)	2 (5%)	4 (5%)	0 (0%)
Patient characteristics						
% smoker		13.20 (7.38)	7.14 (4.81)	2.13 (1.83)	23.87 (16.75)	31.75 (26.33)
Recruitment						
Professional association		35		32	48	49
E-mail		5	43	2	5	9
Colleagues		3		2	3	10
Register for SCC coaches					20	2
Online platform			11		2	
Previous research participation			8	1		
Other ^a		6		1	6	2

^a ‘Other’ includes a regional GP network (practice nurses), the university medical center where three authors are based (gynecologists), a personal invitation by one of the authors, and participants who did not remember where they found the study.

smoked indicated to what extent their smoking behavior presented a barrier. Finally, participants indicated other barriers.

2.4.1.3. Psychosocial characteristics. Answer categories were [1] ‘completely disagree’ – [5] ‘completely agree’, unless indicated otherwise. We measured, with one item each, *agreement* with the guideline’s content (i.e., ‘I agree with the content of the guideline’), *attitude* (‘I find it important that the guideline is implemented correctly’), *motivation* (‘I am motivated to implement the guideline correctly’), *self-reported knowledge and skills* (‘I have sufficient knowledge/skills to implement the guideline correctly’, respectively), *role identity* (‘As a [professional], I see it as my role to implement the guideline correctly’), *descriptive norms* (‘My colleagues implement the guideline correctly’), *injunctive norms* (‘I am expected to implement the guideline correctly’), and *social support* (‘I feel supported in implementing the guideline’). We assessed *self-efficacy* in relation to the 5 As (ask, advise, assess, assist, arrange) with five items ($\alpha = .83$), for example ‘I feel capable of asking a patient whether he/she smokes’. Three items assessed *outcome expectations* ($\alpha = .87$), for example ‘If I use the guideline correctly, more patients will successfully quit smoking’. *Knowledge* about the guideline was tested through five (true/false) statements about the guideline’s content relevant for the respective discipline. A score was calculated by adding the number of correctly rated statements (range 0–5).

2.4.2. Outcome variables

2.4.2.1. Barriers to guideline usage. See above.

2.4.2.2. Guideline familiarity. Participants indicated familiarity with the previous and revised versions of the guideline, with answer categories [1] ‘I do not know it’ [2], ‘I have heard about it, but not read it’ [3], ‘I browsed through it’ [4], ‘I have largely

familiarized myself with it’ [5], ‘I have completely familiarized myself with it’.

2.4.2.3. Dosage delivered. Participants indicated, via self-report, the dosage delivered defined as the % of patients for whom they performed the following tasks, identified as the 5 As [34]: asking about smoking status (10 missing), advising to quit (in a clear and personalized way; 10 missing), assessing quit motivation (8 missing), assisting in quitting (7 missing), arranging follow-up (8 missing). In addition, we assessed dosage delivered of referring patients for SCC (6 missing), and advising/prescribing medication (6 missing). Pediatricians answered these questions for patients and parents separately. In the regression analyses, *dosage delivered* focused on providing *quit-advice* to patients who smoke, as this is considered a key task in the Dutch tobacco dependence guideline [29], and on *assisting* patients who smoke in their quit attempt, as this facilitates successful quitting [29,35].

2.4.2.4. Intention to use the guideline. Participants rated their agreement with ‘I intend to implement the guideline correctly’, [1] ‘completely disagree’ – [5] ‘completely agree’.

2.4.2.5. Satisfaction with own guideline implementation. Assessed with one item, ‘In general, how satisfied are you with how you implement the guideline?’, [1] ‘very dissatisfied’ – [5] ‘very satisfied’.

2.5. Analyses

For RQ1 (guideline familiarity) we performed ANOVAs, followed by Games-Howell post-hoc tests. For RQ1 (dosage delivered) and RQ2 (barriers), we performed nonparametric tests, given the (non-normal) distributions of dosage delivered and barrier variables, and the ordinal measurement level of barrier

Table 2
Guideline familiarity and implementation of the guideline.

Guideline familiarity	Gynecologists (n=49) M (SD)	Midwives (n=68) M (SD)	Pediatricians (n=38) M (SD)	Practice nurses (n=84) M (SD)	Respiratory nurses (n=72) M (SD)	ANOVA ^a
Previous version	2.08 (.76)	3.03 (.93)	1.97 (.72)	3.54 (.75)	3.14 (1.09)	M, PN, RN > P, G PN > M
Revised version	1.82 (.70)	2.09 (.88)	2.03 (.59)	2.48 (1.02)	2.54 (.89)	PN, RN > P, G RN > M

Dosage delivered	Gynecologists (n=49) M (SD)	Midwives (n=66–68) M (SD)	Pediatricians (n=37–38) M (SD)	Practice nurses (n=79–81) M (SD)	Respiratory nurses (n=69–70) M (SD)	Mann-Whitney tests ^b
Ask	86.46 (22.36)	97.46 (13.85)	45.63 (38.43)	89.03 (23.89)	91.43 (19.67)	M > G, P, PN, RN G, PN, RN > P
Ask (parent)			59.05 (36.30)			
Advise	41.50 (38.14)	60.70 (41.41)	33.53 (40.37)	65.67 (33.20)	61.87 (32.77)	M, PN, RN > G, P
Advise (parent)			21.45 (32.73)			
Assess	55.42 (33.70)	72.22 (39.30)	52.21 (40.33)	69.13 (32.24)	69.20 (33.65)	M, PN, RN > G M, RN > P
Assess (parent)			46.08 (34.22)			
Assist	31.27 (35.31)	49.60 (36.62)	28.79 (38.44)	61.43 (35.38)	55.99 (36.81)	M, PN, RN > G, P PN > M
Assist (parent)			16.13 (29.48)			
Arrange	9.48 (17.95)	27.07 (29.90)	15.51 (30.77)	56.26 (34.45)	47.14 (36.69)	M, PN, RN > G, P PN, RN > M
Arrange (parent)			4.59 (17.23)			
Refer	42.40 (40.92)	34.93 (34.07)	32.13 (37.33)	39.81 (36.70)	52.56 (40.74)	RN > M, P
Refer (parent)			35.82 (34.28)			
Advise/prescribe medication/NRT	5.25 (15.39)	3.65 (10.70)	1.08 (4.52)	63.62 (36.06)	49.63 (41.07)	PN, RN > G, M, P PN > RN
Advise/prescribe medication/NRT (parent)			3.03 (7.58)			

^a Significant main effects in ANOVA were followed-up by Games-Howell post hoc tests for unequal variances.

^b Significant differences at $p < .05$ are indicated here. G = gynecologist, M = midwife, P = pediatrician, PN = practice nurse, R = respiratory nurse.

variables. Kruskal-Wallis were used as an omnibus test, followed by Mann-Whitney tests for significant effects. RQ3 was examined using univariable linear regression analyses for intention to use the guideline, satisfaction, and dosage delivered. Predictors that were significantly associated with the outcome were then included in the respective multivariable linear regression model. We examined Tolerance and Variance Inflation Factors to assess multicollinearity (Tolerance < 0.1 and VIF > 10 indicate multicollinearity) [36]. For RQ4, we performed three separate sets of regression tree analyses [37] for intention to use the guideline, satisfaction, and dosage delivered, using all predictors that were used in the univariable linear regression analyses. Regression tree analyses were used instead of other multivariable regression techniques, because the procedure examines (higher-order) interactions between variables that do not need to be pre-specified, thereby yielding new insights. It has an inherent cross-validation procedure to assess generalizability of the findings. The procedure examines in a data-driven manner whether predictor variables interact, and searches for optimal cut-off values in predictor variables. The minimum number of participants per leaf was fixed at 10, and the minimum increase in fit (complexity parameter) was set at 0.0001. For the

remaining parameters we used default options. The selection process of the initial, non-pruned tree was performed 1000 times. If one predictor variable dominated the solution, we repeated the analyses without this variable. Regression tree analyses were performed using the Rpart package version 4.1–9 in R statistical software version 3.2.5 [38,39]. Afterwards, we calculated effect sizes (eta squared, η^2) through a set of oneway ANOVAs with the terminal nodes as categories of the factor. All analyses were performed using data from participants with full data for the variables in the respective model (i.e., a few participants were omitted from dosage delivered analyses). We ensured that the assumptions of all analyses were met.

3. Results

3.1. Descriptives

Most participants were female, never smokers, and had participated in SCC training. Nurses had more smokers among their patients than other groups and were more likely to have participated in SCC training (Table 1).

Table 3
Barriers to guideline implementation.

Barrier	Gynecologists (n = 49)		Midwives (n = 68)		Pediatricians (n = 38)		Practice nurses (n = 84)		Respiratory nurses (n = 72)		Mann-Whitney tests ^a
	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	
Guideline											
Adaptability	2.80 (1.00)	4%	2.74 (.97)	3%	2.82 (1.04)	3%	2.12 (.86)	1%	2.46 (1.07)	3%	G, M, P > PN G > RN
Complexity	2.76 (.95)	2%	2.66 (.94)	3%	2.66 (.91)	1%	2.08 (.78)	0%	2.18 (.81)	0%	G, M, P > PN, RN
Compatibility patients					2.84 (.97)	3%					N.a.
Organizational	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	
Time	3.90 (1.10)	37%	4.16 (.99)	50%	3.92 (.97)	34%	3.05 (1.15)	12%	2.78 (1.13)	10%	G, M, P > PN, RN
Materials	3.33 (.97)	12%	3.22 (1.18)	18%	2.89 (.92)	5%	2.82 (1.03)	4%	2.64 (1.04)	7%	G, M > PN, RN G > P
Patient reimbursement	3.59 (1.08)	27%	3.90 (1.13)	40%	3.29 (1.11)	16%	3.02 (1.25)	13%	3.04 (1.16)	14%	G, M > PN, RN M > P
Professional rewards							2.55 (1.03)	2%	2.31 (1.17)	7%	No sign. differences
Referral possibilities	3.55 (1.10)	20%	3.34 (1.11)	16%	3.11 (1.03)	5%	2.77 (1.05)	5%	2.54 (1.02)	4%	G, M > PN, RN P > R
Task interference	3.73 (1.00)	25%	3.49 (1.20)	24%			2.65 (1.09)	6%	2.76 (1.18)	11%	G, M > PN, RN
Patient Resistance	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	No sign. differences
Relationship	3.27 (1.02)	8%	3.51 (.86)	9%							No sign. differences
Sensitive subject	2.67 (1.01)	6%	2.78 (1.03)	7%			3.49 (1.08)	18%	3.13 (1.26)	17%	M > G, RN
Dishonest	3.22 (1.09)	12%	3.63 (1.17)	27%			3.08 (.82)	3%			N.a.
Uncooperative							3.00 (.93)	5%			N.a.
Uncooperative (parents)							2.79 (.88)	3%			N.a.
Unmotivated									3.15 (.91)	6%	No sign. differences
Own Training	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	M (SD)	% "strong" barrier	
Own smoking ^b	4.31 (.89)	57%	3.43 (1.07)	21%	3.84 (1.22)	42%	2.37 (1.04)	4%	2.78 (1.39)	17%	G, M, P > PN, RN G > M
	1.33 (.58)	0%	1.43 (.79)	0%	1.50 (.71)	0%	1.25 (.50)	0%	N.a.	N.a.	N.a.

^a Significant differences at p < .05 are indicated here. G = gynecologist, M = midwife, P = pediatrician, PN = practice nurse, R = respiratory nurse.

^b 3 gynecologists (6%), 7 midwives (10%), 2 pediatricians (5%), 4 practice nurses (5%) and no respiratory nurses indicated that they were current smokers.

3.2. Guideline implementation (RQ1)

Practice and respiratory nurses were most familiar with the previous and revised versions of the guideline (Table 2). Significant differences between the groups were found in dosage delivered of all tasks. Only 25 participants (8%) provided the 5 As (i.e., ask, advise, assess, assist, arrange) to at least 90% of patients. Midwives were most likely to ask their patients about smoking status (almost always), whereas pediatricians were least likely. Gynecologists and pediatricians were least likely to provide quit-advice, assess quit motivation, assist in quitting, and arrange follow-up. Respiratory nurses most often referred their patients for SCC. Practice nurses and respiratory nurses advised/prescribed medication or nicotine replacement therapy to around half of patients, whereas gynecologists, midwives and pediatricians hardly did so. Percentages reported by pediatricians were roughly similar for patients and their parents, although pediatricians seemed to refer more parents than patients for SCC.

3.3. Barriers to guideline usage (RQ2)

The main barrier to implementing the guideline was ‘lack of training’ for gynecologists and pediatricians (57% and 42% ‘strong

barrier’, respectively), ‘lack of time’ for midwives (50% ‘strong barrier’), and ‘smoking being a sensitive subject’ for practice nurses and respiratory nurses (17% ‘strong barrier’ each), Table 3. Notably, practice nurses and respiratory nurses reported fewer, and weaker, barriers than the others groups. Of the barriers assessed among all groups, lack of guideline adaptability, guideline complexity, lack of time and lack of training were more important for gynecologists, midwives and pediatricians than for practice and respiratory nurses. Lack of materials and insufficient reimbursement for patients were stronger barriers for gynecologists and midwives than for practice and respiratory nurses. None of the 16 participants who smoked indicated that this was an important barrier.

Furthermore, 106 participants answered the open-ended question about additional barriers. The majority of these participants mentioned lack of familiarity with the revised version of the guideline (10/14 pediatricians, 13/28 respiratory nurses, 7/28 practice nurses, 11/14 gynecologists, and 10/22 midwives). Some barriers listed in the closed-ended question were repeated. Three pediatricians perceived addressing smoking as uncommon in their profession. Three respiratory nurses mentioned that regulations prevented them from providing SCC (e.g., need for being registered as SCC coach), and two (pediatric) respiratory nurses felt that

Table 4
Explaining intention to use the guideline, satisfaction and dosage delivered (Advise and Assist).

Predictor variables	Intention to use guideline (N=311)		Satisfaction (N=311)		Dosage delivered			
	Univariable	Multivariable	Univariable	Multivariable	Advise to quit (N=301)		Assist in quitting (N=304)	
					Univariable	Multivariable	Univariable	Multivariable
Participant characteristics								
Age	.11 ⁺		.23 ^{**}	-.03	.06		.12 ⁺	.00
Gender (male)	.02		-.14 ⁺	.03	-.17 ⁺	-.03	-.18 ^{**}	-.05
Profession								
PN (ref.)	0	0	0	0	0	0	0	0
Gynecologist	-.19 ^{**}	.03	-.54 ^{**}	-.16 ⁺	-.23 ^{**}	.15 ⁺	-.29 ^{**}	.02
Midwife	-.18 ^{**}	-.07	-.37 ^{**}	-.17 ⁺	-.05	.12	-.13 ⁺	.08
Pediatrician	-.07	-.02	-.41 ^{**}	-.13 ⁺	-.28 ^{**}	.04	-.28 ^{**}	-.03
RN	-.03	-.05	-.08	.03	-.04	-.02	-.06	-.04
Years worked	.02		-.01		.02		.06	
SCC training	.26 ^{**}	.16 ⁺	.53 ^{**}	.10	.39 ^{**}	.27 ^{**}	.34 ^{**}	.01
Smoking status								
Never (ref.)	0		0		0		0	
Ex-smoker	.10 ⁺		.15 ⁺	-.03	.07		.08	
Current	-.02		.08	.08 ⁺	-.01		-.05	
Patient characteristics								
% smoker	.07		.30 ^{**}	-.03	.21 ^{**}	.08	.23 ^{**}	.05
Psychosocial determinants								
Agreement content	.35 ^{**}	.00	.38 ^{**}	.13 ⁺	.12 ⁺	-.04	.21 ^{**}	.06
Attitude	.72 ^{**}	.22 ^{**}	.13 ⁺	-.11 ⁺	.02		.09	
Motivation	.80 ^{**}	.47 ^{**}	.19 ⁺	.03	.08		.12 ⁺	.00
Self-efficacy	.24 ^{**}	.07	.54 ^{**}	.11 ⁺	.44 ^{**}	.32 ^{**}	.42 ^{**}	.21 ^{**}
Knowledge (self-report)	.24 ^{**}	-.01	.54 ^{**}	.13 ⁺	.25 ^{**}	.07	.30 ^{**}	.07
Knowledge (tested)	.03		.20 ⁺	-.01	.10 ⁺		.02	
Skills	.33 ^{**}	-.01	.51 ^{**}	.13 ⁺	.22 ^{**}	-.06	.27 ⁺	-.05
Role identity	.69 ^{**}	.21 ^{**}	.09		.09		.12 ⁺	.09
Outcome expectations	.29 ^{**}	-.05	.12 ⁺	-.01	.03		.04	
Descriptive norms	.11 ⁺	-.02	.34 ^{**}	.07	.11 ⁺		.14 ⁺	.00
Injunctive norms	.37 ^{**}	.02	.09		-.02		.04	
Social support	.29 ^{**}	.01	.42 ^{**}	.10 ⁺	.09		.17 ^{**}	-.03
Barriers								
Guideline adaptability	-.13 ⁺	.07 ⁺	-.19 ⁺	-.05	-.10 ⁺		-.11 ⁺	
Guideline complexity	-.25 ^{**}	-.06	-.28 ^{**}	.04	-.14 ⁺	-.01	-.15 ⁺	.07
Time	-.08		-.33 ^{**}	-.02	-.15 ⁺	-.01	-.25 ^{**}	-.12 ⁺
Materials	-.14 ⁺	-.01	-.21 ^{**}	.04	-.08		-.09	
Patient reimbursement	-.08		-.15 ⁺	.04	-.05		-.10 ⁺	
Referral possibilities	-.10 ⁺		-.22 ^{**}	-.02	-.05		-.09	
Training	-.13 ⁺	.08	-.62 ^{**}	-.23 ^{**}	-.35 ^{**}	-.06	-.45 ^{**}	-.28 ^{**}

Note. Values reported in the table are β values. PN=practice nurse; RN=respiratory nurse; SCC=smoking cessation care. Only barriers that were measured among all participants were included in these analyses.

Multivariable model for intention to use guideline R² = .72, p < .001; satisfaction R² = .59, p < .001; advise R² = .26, p < .001; assist R² = .28, p < .001.

⁺ p < .10.

⁺ p < .05.

^{**} p < .01.

addressing parents' smoking behavior is inappropriate. Among practice nurses, bureaucracy concerning patients' reimbursement or medication prescriptions was mentioned five times. Finally, three midwives perceived the patients' social environment (e.g., smoking partner) as a barrier, and two midwives mentioned patient characteristics such as educational level, IQ, and insufficient proficiency in the Dutch language.

3.4. Prediction of intention to use the guideline and guideline implementation (RQ3, RQ4)

3.4.1. Linear regression analyses (RQ3)

The multivariable regression model showed that *intentions to use the guideline* were significantly stronger among participants who were more motivated to use the guideline, who had positive attitudes toward the guideline, perceived the implementation of the guideline as part of their role (e.g., as gynecologist), and had participated in training in the past (Table 4). *Satisfaction* was higher among participants who did not perceive 'lack of training' as an important barrier, were practice nurses and respiratory nurses, had stronger agreement with the guideline's content, had stronger knowledge, skills, and self-efficacy, and received more social support for using the guideline. Participants *advised* more smokers to quit if they had participated in SCC training and reported stronger self-efficacy. Finally, participants *assisted* more smokers in quitting smoking if they had stronger self-efficacy and did not report 'lack of training' as a barrier.¹

3.4.2. Regression tree analyses (RQ4)

3.4.2.1. Intention to use the guideline. Results showed a tree with one split on motivation to use the guideline, which was also the strongest predictor in the multivariable regression model. Specifically, participants with a motivation of 4.5 or higher (between 'agree' and 'completely agree') had stronger intentions to use the guideline (intention 4.8) than those whose motivation was below 4.5 (intention 3.8), $\eta^2=0.44$, $p<.001$. A follow-up analysis without motivation as a predictor showed that participants who found correct implementation of the guideline very important (≥ 4.5) had strong intentions to use the guideline (Fig. 1). Among those who found this less important, participants with stronger role identities had stronger intentions than those with weaker role identities, $\eta^2=0.51$, $p<.001$.

3.4.2.2. Satisfaction with implementation. Participants who indicated that lack of training was, at least to some extent, a barrier (≥ 2.5) were less satisfied with their implementation of the guideline (satisfaction 3.1). Other participants were more satisfied (5.0), $\eta^2=0.31$, $p<.001$. When the dominant variable 'lack of training' was excluded from model, a tree emerged with profession, knowledge and skills (Fig. 2). The first split was on profession, with practice nurses and respiratory nurses being more satisfied (satisfaction 4.7) than gynecologists, midwives and pediatricians (satisfaction 2.9). Among nurses, those with more skills were more satisfied than those with less skills. Gynecologists, midwives and pediatricians with more self-reported knowledge were more satisfied than those who reported less knowledge, $\eta^2=0.44$, $p<.001$.

¹ The associations between guideline agreement and outcomes were very similar when we controlled for familiarity with the previous and revised versions of the guideline. The multivariable models showed that agreement was only significantly related to implementation quality, and this association remained significant when we added the familiarity variables as additional independent variables (in two separate analyses). Neither familiarity variable was significantly related with implementation quality.

3.4.2.3. Dosage delivered (quit-advice). Self-efficacy was most important for providing quit-advice (Fig. 3). Participants with stronger self-efficacy (≥ 3.9) provided quit-advice to 71% of patients on average, whereas those <3.9 on self-efficacy provided quit-advice to 38% of patients. Among the latter group, a second split on self-efficacy showed that those who scored between 3.3–3.9 advised 48% of patients to quit, whereas those <3.3 on self-efficacy advised only 24% of patients to quit. Finally, within the group of participants lower than 3.3 on self-efficacy, those with previous training advised 51% of patients to quit, compared to only 13% among those without SCC training, $\eta^2=0.28$, $p<.001$.

3.4.2.4. Dosage delivered (assist). Participants who indicated that lack of training was a relatively strong barrier (≥ 3.5) assisted 31% of patients in quitting, versus 61% among participants who did not perceive lack of training as a strong barrier (<3.5), $\eta^2=0.15$, $p<.001$. The follow-up analysis without lack of training again showed a regression tree with one split, such that participants with higher self-efficacy (≥ 3.7) assisted 60% of patients in quitting, whereas those <3.7 on self-efficacy assisted 29% of patients, $\eta^2=0.14$, $p<.001$.

4. Discussion and conclusion

This is the first study to examine the implementation of a tobacco dependence guideline among gynecologists, midwives, nurses working in general practice, respiratory nurses, and pediatricians, representing a broad spectrum of professionals. Understanding the differences in practice behavior among HCPs is important, as SCC delivered across the continuum of care can be synergistic with regard to cessation outcomes. This study also adds to the literature by showing how determinants, in combination, affect outcomes. Although we examined a specific Dutch guideline, the results are relevant for SCC more broadly [35]. Our results show that the guideline was better implemented among nurses and midwives than gynecologists and pediatricians – who were less trained in SCC and encountered fewer smokers among their patients. Furthermore, Dutch physicians are likely less accustomed to counseling patients (this is typically assigned to nurses), such that providing SCC might be more difficult for them. On the other hand, SCC guidelines do not require every HCP to provide counseling themselves (i.e. advising and referring would also be guideline-adherent). Results also showed that nurses experienced fewer barriers to guideline implementation than other groups, possibly because they were more experienced and trained in providing SCC. Gynecologists and pediatricians reported lack of training as the main barrier, whereas midwives most often reported lack of time. These barriers were also identified in previous work [15,16]. Concerns about harming the relationship with the patient however appeared less important for midwives in the current study than in a previous review [22]. Although a quarter of midwives did perceive smoking cessation to be a sensitive subject, they might have acquired skills to address smoking without harming the HCP-patient relationship. Practice and respiratory nurses were hindered most by perceptions that smoking is a sensitive subject for patients, but barriers were low among nurses. Although lack of training thus appeared less important for nurses, a recent qualitative study among Dutch practice nurses showed that they perceived a lack of *high-quality* training specifically [9]. Notably, whereas midwives experienced similar (extent of) barriers to guideline implementation as gynecologists and pediatricians, their guideline implementation was better. This could relate to Dutch governmental regulations that each midwifery practice should employ at least one midwife trained in SCC and to develop a SCC protocol.

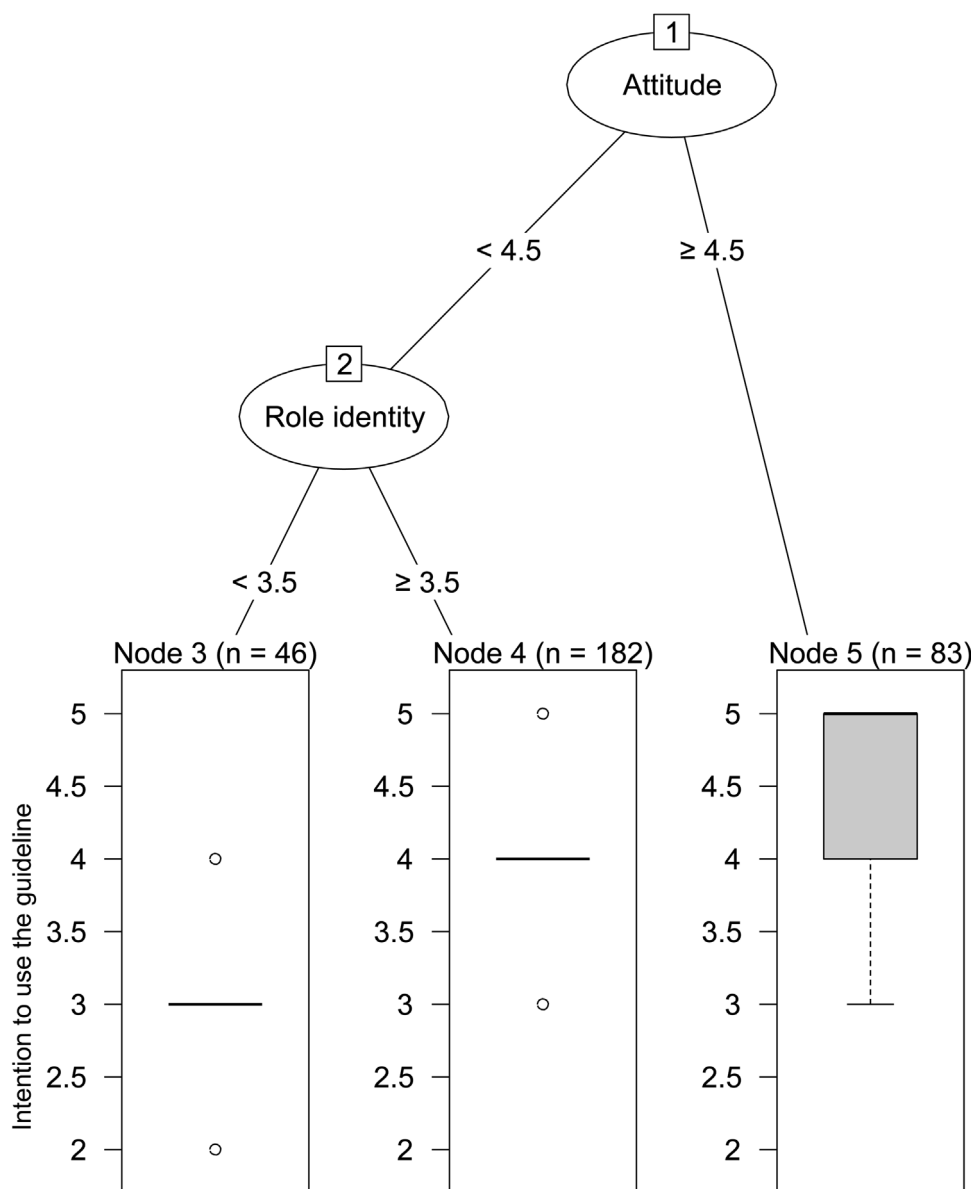


Fig. 1. Regression tree for Intention to use the guideline.
 Note. Attitude and role identity range from 1–5, with higher scores indicating more positive attitudes toward the guideline and stronger role identities, respectively.

Corresponding with previous findings, participants had stronger intentions to implement the guideline if they had more motivation, more positive attitudes, stronger role identities, and had participated in SCC training [7,24]. Attitudes and role identities interacted in explaining intentions, such that among participants who found guideline implementation less important, those with stronger role identities still had stronger intentions than those with weaker role identities. Those with stronger role identities may be more extrinsically motivated, if they feel that it is expected of them to provide SCC given their profession. Satisfaction was higher among practice and respiratory nurses (vs. gynecologists, midwives, and pediatricians) and among participants who agreed with the guideline’s content, had more knowledge, skills, and self-efficacy, perceived stronger social support for guideline implementation, and did not experience lack of training as a barrier. Satisfaction thus appears associated with a sense of competence. Interestingly, whereas among practice nurses and respiratory nurses satisfaction was higher if they reported more skills, among the other groups

more knowledge was associated with higher satisfaction. It is possible that knowledge and skills play different roles within professions, with nurses putting more emphasis on skills given the more practical nature of their work and larger role in SCC. Conversely, knowledge may be more important among gynecologists and pediatricians with lower guideline awareness [40]. Many participants reported that they did not provide quit-advice to many patients who smoke, which may (implicitly) communicate to patients that smoking is irrelevant, or even approved of. Self-efficacy and training were important for advising to quit and assisting in quitting [41]. Quit-advice was provided more often by HCPs who had participated in SCC training and reported stronger self-efficacy. Furthermore, it appeared that previous SCC training improved dosage delivered among participants with lower self-efficacy, who provided quit-advice more often if they had participated in SCC training. Finally, participants with stronger self-efficacy and who did not perceive lack of training as a barrier to SCC assisted more smokers in quitting.

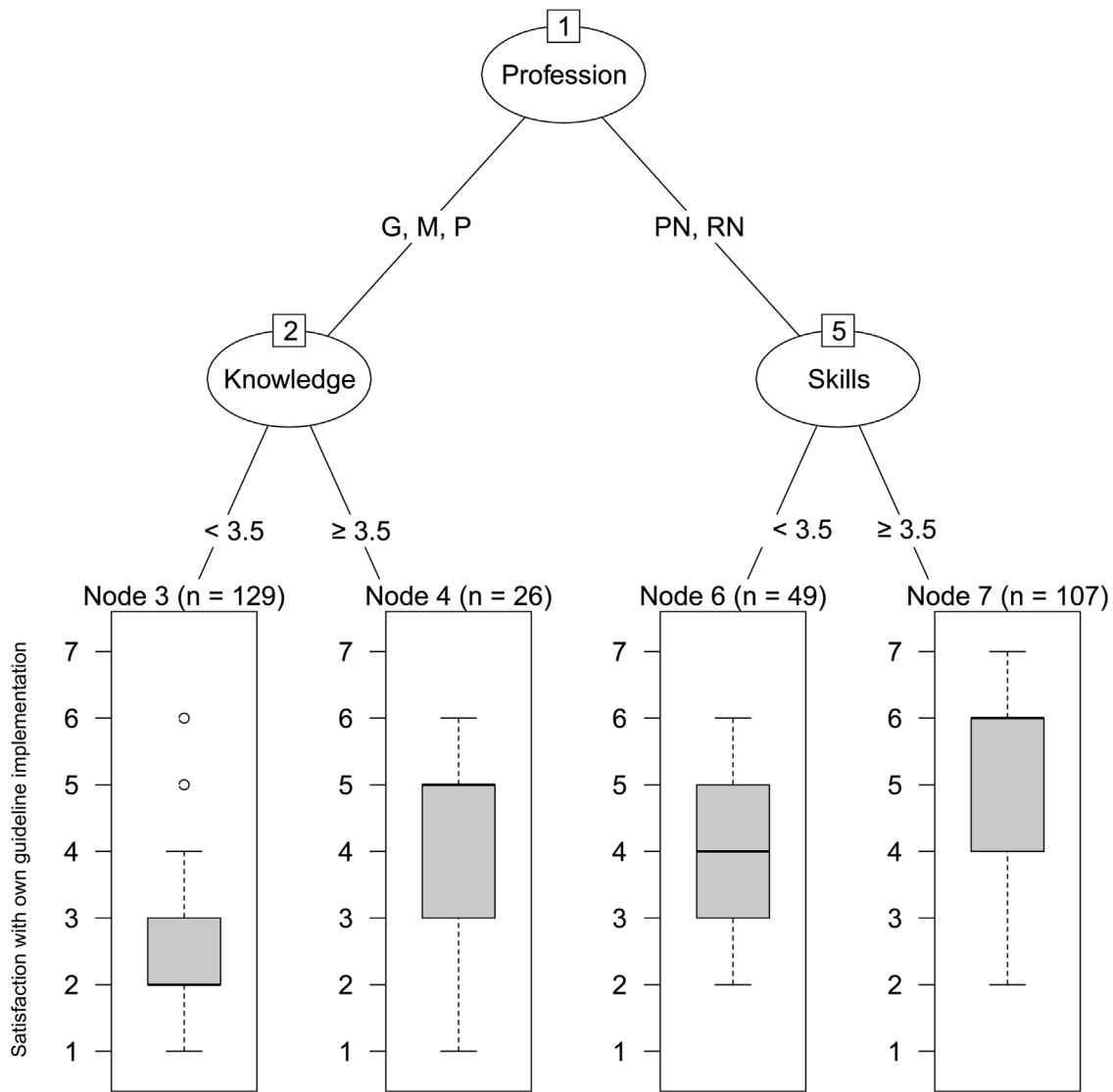


Fig. 2. Regression tree for Satisfaction with own guideline implementation.
 Note: G = Gynecologists; M = Midwives; P = Pediatricians; PN = Practice nurses; RN = Respiratory nurses. Knowledge and skills range from 1-5, with higher scores indicating more self-reported knowledge and skills with regard to implementing the guideline correctly.

4.1. Limitations

First, as is common in implementation research, participants interested or experienced in SCC may have been overrepresented in this study, which was part of a larger study that aimed to improve guideline implementation through text messages. Recruitment through the registry of Dutch SCC coaches (7% of the study sample) may have contributed to this selection bias. Hence, results might be optimistic. However, the majority of participants were recruited through other means, such as professional associations, colleagues, or direct e-mails to (midwife) practices, ensuring that participants with less experience in SCC were also included. A potential downside of this diversity of recruitment strategies is the unknown response rate. Second, results were based on self-report, and participants may have overestimated their adherence [42], although we ensured anonymity and confidentiality. Different methods of data collection, such as observation through video fragments, were not possible in the current online study design, and have their own disadvantages (e.g., altering healthcare professionals' behavior) [42]. Third, we did not explicitly target respiratory nurses working in pediatric

care for study participation in the study, such that this subsample was relatively small, and we did not ask them about parents. Given differences between respiratory nurses working with children or adults (see Supplementary materials), future research should include more pediatric respiratory nurses. Finally, although six barriers were assessed among all groups, some barriers were only assessed in specific groups in which they were considered relevant based on previous literature. Comparison between groups on the latter barriers was not possible. Arguably, measurement of all barriers in all groups would have increased questionnaire length and, possibly, drop-out.

4.2. Practice implications

Training in SCC appears key to improving guideline implementation. Participants who had participated in SCC training reported stronger intentions to use the guideline and provided more quit advice, with training being particularly important for quit-advice among participants with lower self-efficacy. In addition, participants who experienced lack of training as a barrier were less satisfied with their guideline implementation, and assisted fewer

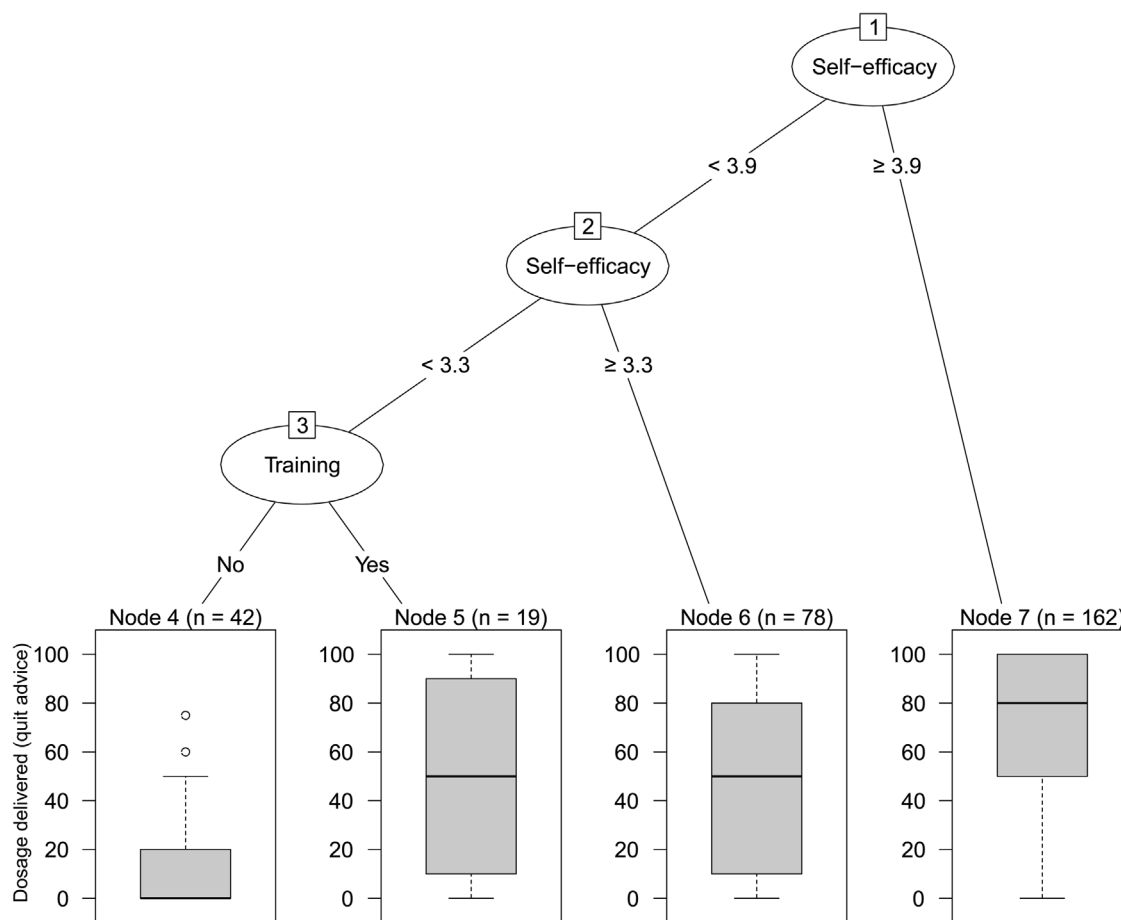


Fig. 3. Regression tree for Dosage delivered of quit-advice.
 Note. Self-efficacy refers to implementation of the 5A tasks ask, advise, assess, assist, arrange. Possible scores range from 1–5, with higher scores indicating stronger self-efficacy. Training refers to previous participation in smoking cessation care training.

smokers in quitting. Lack of training also was the key barrier among gynecologists and pediatricians, who implemented the guideline less well than other groups. However, a recent review showed that participation in SCC training has its own barriers, such as lack of interest and time, and other priorities [43]. Novel ways of providing training that reach large numbers of healthcare providers, with minimal investment of time and effort, should be investigated. For example, in addition to traditional face-to-face training, possibilities with e-learning programs or flexible methods of communication (e.g., text messages) may be helpful. Healthcare professionals’ associations appear well suited to promoting SCC training among their members, and their involvement may also positively affect other determinants of implementation (e.g. agreement with the guideline).

4.3. Conclusion

The findings call for a targeted approach to improving SCC among different groups of healthcare professionals. Results suggest that it may be beneficial to focus more on improving knowledge in training for midwives, gynecologists and pediatricians, whereas practice and respiratory nurses may benefit more from skills training (e.g., focused on discussing sensitive subjects). Furthermore, lack of time obstructed SCC among gynecologists, midwives and pediatricians (in line with [15,21,23]). As creating more time requires a fundamental change in organization of care, training may focus on ways to limit time needed for SCC. Although providing the 5As (Ask-Advise-Assess-Assist-Arrange) does not

require much time [44], a more limited model of SCC such as Ask-Advise-Refer or Ask-Advise-Connect [45] may be more appropriate for healthcare professionals who are less specialized in SCC. Alternatively, lack of time may (partly) reflect lack of prioritizing smoking cessation, in which case an approach focused on healthcare professionals’ attitudes towards SCC would be more appropriate. Finally, the importance of advising to quit should become more salient for healthcare professionals in all groups. This will improve SCC care, such that more smokers can quit smoking successfully.

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Declaration of interest

none.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.pec.2019.01.015>.

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