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ORIGINAL ARTICLE

The effect of a smoking cessation program for patients in cancer treatment: a quasi-experimental intervention study

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ABSTRACT

Background: Compared to non-smokers, smokers have reduced effects of cancer treatment, and increased risk of treatment-related toxicity. Quitting smoking can improve treatment effects and reduce side effects. This study reports on the potential impact of a smoking cessation program on smoking cessation rates among patients in cancer treatment.

Material and methods: Cancer patients 18 years and older who smoked, with survival prognosis ≥12 months, not suffering dementia or other mental illness, and who were referred to cancer treatment at six Norwegian hospitals were invited to participate. The study took place from 2017 to 2020 and used a pre-test-posttest non-equivalent control group design. The intervention group received structured smoking cessation guidance based on Motivational Interviewing combined with cost-free nicotine replacement products, while the control group received standard smoking cessation treatment. Self-reported smoking status were registered at baseline and at 6 months' follow up.

Results: 76% of patients smoked at baseline and 44% at follow-up in the intervention group, correspondingly 72% and 49% in the control group. In an analysis of differences in within-person change, the reduction in the intervention group was 13 percentage points larger (95% CI = (0.25, −0.005), $p = 0.041$). Adjusting for gender, age, education, labour market participation and partnership status did not attenuate the estimated effect (18 percentage point difference, 95% CI = (−0.346, −0.016), $p = 0.032$). Demographic factors and dropout rate differed somewhat between the groups with a higher dropout rate in the intervention group, 54% vs. 51%, respectively).

Conclusion: Offering a structured smoking cessation program based on Motivational Interviewing and cost-free nicotine replacement products to cancer patients can increase cessation rates in comparison to standard smoking cessation care.

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KEYWORDS
Smoking cessation; cancer treatment; motivational interviewing; nicotine replacement products

Background

Compared to non-smokers, smokers have an increased risk of cancer mortality, new and recurrence of cancer, reduced effects of cancer drugs and radiation therapy, and increased risk of treatment-related toxicity [1–3]. Compared with smoking patients, never-smoking patients and patients who have quit have a higher quality of life and level of function. This also applies to patients in palliative care [4]. Quitting smoking can improve the cancer treatment effect and reduce side effects.

Cancer patients may be motivated for quitting smoking [5,6], and the time of diagnosis may be a teachable moment for behaviour change [7]. Findings from previous studies have demonstrated quit rates between 40 and 70% among current and former smokers in relation to cancer diagnoses and treatment initiation [8–11]. Although such quit rates are high, they also imply that a substantial proportion of cancer patients continue smoking. It may therefore be relevant for cancer hospital wards to offer a smoking cessation program as part of the standardised treatment for their patients [12]. How smoking cancer patients are being followed up during their smoking cessation attempt varies [13]. A Norwegian survey in 2015, showed that only one oncology centre had an in-house smoking cessation program, although a few more centres supplied smoking patients with a free sample of smoking cessation products and information about cessation. A recent national survey (2022) showed a positive change, but still, only 25% of all centres had a structural

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smoking cessation program as part of their standard care (R.P. van Helvoirt, personal communication). A recent cost-effectiveness study suggested that the implementation of an intensive smoking cessation program among cancer patients was moderately to highly cost-effective depending on the existing smoking cessation program [14]. The general national guidelines in Norway for smoking cessation recommend individual, structured guidance in combination with pharmaceutical aids to increase quit rates [15]. There are, however, considerable variations in the content and extent of smoking cessation programs that are offered at the cancer wards in Norwegian hospitals.

A systematic review of studies examining smoking cessation in connection with cancer care found that high-intensity interventions aimed at-risk behaviour and/or consisting of several components such as drug treatment, behavioural counselling and social support were the most successful interventions for individuals with cancer [13]. Motivational Interview is a collaborative, goal-oriented style of communication that is designed to strengthen personal motivation for, and commitment to, a specific goal by eliciting and exploring the person's own reasons for change [16]. A Cochrane review concluded that Motivational Interviewing could help people quit smoking, but it emphasised that there were large variations in study quality and intervention implementations [17]. Motivational Interview-based, systematic smoking cessation programs have as far as we know not been tested and evaluated in Norwegian hospital environments before.

Objectives

In this study, we analysed the effect on smoking cessation by offering a Motivational Interview-based smoking cessation program with free nicotine replacement products to cancer patients in treatment compared to the standard smoking cessation care used in hospitals.

Material and methods

Study design

The study protocol was published prior to the study start at ClinicalTrials.gov. The design of the study was a pre-test post-test non-equivalent control group design, where the intervention group was recruited after completing the recruitment of the control group.

The intervention group received structured smoking cessation guidance based on Motivational Interviewing, adapted to cancer treatment, combined with the offer of free nicotine replacement products. The control group received the individual hospital's standard care smoking cessation program. The standard cessation treatment varied between hospitals but was less structured and comprehensive than the intervention, see Appendix A for a description.

The intervention

The smoking cessation program combined non-pharmacological and pharmacological approaches. The counselling provided in the program was based on Motivational Interviewing. In addition, the intervention included offers of free (nicotine replacement products (see Appedix B), shown to increase the likelihood of quitting [18].

The smoking cessation guidance was done as one-to-one counselling sessions. The first counselling session was a physical meeting, before the cancer treatment began. The following sessions were in connection with the patients' scheduled cancer treatments at the hospital premises. Counselling was also provided by telephone for patients who wanted more frequent counselling. Patients were offered at least four individual counselling sessions (30-45 min each) and follow-ups as needed within six months.

The intervention was delivered by trained nurses/radiation therapists who received training in Motivational Interview counselling provided by the Norwegian Cancer Society in collaboration with the Norwegian Directorate of Health and was an adaptation of the Directorate's smoking cessation program. Each hospital was provided with funds to cover 50% of a smoking cessation supervisor position. A smoking cessation manual was prepared for the supervisors and an information leaflet for the participants.

Study participants and recruitment

The participants were cancer patients recruited at the oncology departments of six hospitals in Norway at their first referral for treatment after a recent cancer diagnosis, at follow-up of treatment that had started at another hospital, or in connection to treatment given for other aspects of the cancer diagnosis, such as side effects of cancer treatment. They were 18 years or older at recruitment and smoked daily or non-daily or had stopped smoking less than six weeks prior to the invitation (assessed by the general practitioner at recruitment). Cancer patients with an estimated survival of less than 12 months, and patients who suffered from dementia or other mental illness affecting the ability to give informed consent, were ineligible for inclusion.

The patients received a brief smoking status screening form (by mail) together with the information letter regarding their first consultation at the hospital. The patients brought the form to the first consultation with the doctor. The patient's smoking status was registered at arrival and the physician assessed if the patient met the inclusion criteria. Eligible participants (control or intervention group) were informed orally and in writing about the study. Patients eligible for the intervention group, were additionally informed that they would be offered a smoking cessation program (without receiving further details about the program at that stage).

Control group participants were recruited between September 2017 and February 2019, while intervention group participants were recruited between March 2019 and March 2020. Calculations of statistical power showed that at least 600 participants were needed in each group. However,

recruiting participants was more difficult than expected. According to involved personnel at hospitals, the difficulties were mainly related to the recruitment procedures, particular at the largest hospitals. The recruitment periods for the control and the intervention groups were therefore extended beyond what was planned.

Data collection process

Following the initial consultation, the physicians referred eligible participants to a nurse or radiation therapist who provided more information about the study and assisted the patients with the baseline online questionnaire. Some patients needed a few days to consider whether they wanted to participate, and completed the baseline survey by telephone, e-mail (link to questionnaire), or paper and pen.

The follow-up survey was sent by e-mail (link to online questionnaire) six months after baseline. A reminder was sent by e-mail after 1-2 weeks. A password-secured list of names of participants who did not respond was sent to their respective hospitals along with a list of patients who lacked e-mail addresses. The smoking cessation counsellor contacted these patients by telephone and filled in the form electronically on behalf of, and in consultation with, the patient.

Measures

Baseline questionnaires included questions about smoking status; never, former (relevant for those who had quit less than six weeks prior to baseline), and daily or non-daily smoking, and questions about cancer diagnosis, age, gender, education, occupational and partnership status (marriage or cohabitation), hospital admission and social security number. At six months' follow-up, smoking status was registered by self-reports using the same smoking categories as for baseline.

Statistical analyses

We used Stata, version 16.0 for all analyses. To analyse the effects of the smoking cessation program on smoking status at follow-up, we applied a linear probability model where the outcome was the change in smoking status from baseline to follow-up. Smoking status was coded as non-smoker or smoker (daily and occasional smoking combined into one category). Covariates were gender, age, education, occupational status (work/retirement), partnership status, and hospital identification indicators. The effect estimate represents the percentage point change in smoking status that might be attributed to offering the smoking cessation intervention (i.e., intention-to-treat) among patients who completed both the baseline and follow-up questionnaire (complete case analysis).

We applied the complete case analyses on the smoking status change scores as our main model due to the straightforward interpretation of the coefficients. In addition, we report results from a random effects logit model where we utilised all available data (including patients with no follow-up data). To estimate differences in predicted proportions of smokers, which is an effect size that can be easily interpreted and compared with the coefficients from the linear probability model, we use the *margins* command.

As there is substantial attrition from baseline to follow-up and some missing data on covariates, we also ran the random effects logit model on 10 multiply imputed datasets using the *mi impute chain* command. The estimates were combined using the *mi estimate* function. We imputed values for smoking status, partnership status, sex, and age. The same variables were used as predictors in the imputation, in addition to indicators for the time period and intervention group. The covariate-adjusted analyses included the variables gender, age, education, labour market participation, partnership status and hospital.

As those who fail to quit smoking may be less likely to respond to the follow-up, we included a robustness test where we ran the main model on data where all patients who responded to baseline but not follow-up were coded as smokers in the follow-up.

Ethics and data protection

Individual data collected at different times during the study were linked based on the participants' social security numbers as well as e-mail address, names, and postal address, which were registered at recruitment. To protect personal data, we used the web-based questionnaire developed by Service for Sensitive Data at the University of Oslo for data collection and their server for data storage. All analyses were performed within this platform. Written informed consents to participate in the study was obtained from the participants. The study was approved by the internal ethics board at the Norwegian Institute of Public Health. The identifier for the published study protocol at ClinicalTrials.gov was NCT03328962.

Results

Almost 20% ($n = 507$) of the 2 650 registered cancer patients who completed the screening forms were defined as smokers on their first arrival to the hospital and eligible participants in the study. They were either daily or (12.7%, $n = 325$) occasional smokers (4.1%, $n = 105$), or had stopped smoking within the last six weeks (3%, $n = 77$). Only one-third ($n = 846$) of the 2 650 patients were never smokers.

A total of 440 study participants (87%) were recruited out of the 507 smokers identified, 208 in the control group, and 232 in the intervention group. Less than half ($n = 199$) completed the follow-up survey. Some of the patients died before follow-up, some dropped out from the cessation program, and some refrained from responding. As shown in Table 1, the participants in the intervention group differed somewhat from those in the control group by being slightly younger (mean 61 vs. 64 years among complete cases), having higher levels of education (28 vs. 18%), and less likely to be retired (35 vs. 48%). In Appendix C, we present an overview of the cancer types of the Treatment and Control groups. Lung,

Table 1. Socio-demographic characteristics of study participants at the study baseline.

	Control		Treatment		All
	Complete Case	Drop-out	Complete Case	Drop-out	
N	93	115	108	124	440
Smoking[a], %	85	83	88	93	87
Mean age (SD)	64 (9)	66 (10)	61**(11)	63 (10)	63 (10)
Sex, % women	66	53	61	56	58
Partnership status, % married or cohabiting	60	66	66	60	63
Education, % with at least 4 years of college	18	20	28*	25	23
Working, %	31	19	37	28	29
Retired, %	48	55	35**	44	45
Not working or retired, %	20	25	28	28	25

*$p < 0.05$, ** $p < 0.01$, *t*-test of the differences between the treatment and control group. [a]Daily and occasional smokers combined.

Table 2. Smoking status at baseline and at 6-months follow-up for those attending both baseline and follow-up. Percentages.

	Control ($N = 92$)		Treatment ($N = 107$)	
Smoking status	Baseline	6 months follow-up	Baseline	6 months follow-up
Daily	67 (72%)	46 (49%)	82 (76%)	47 (44%)
Occasionally	11 (12%)	18 (19%)	12 (11%)	17 (17%)
Current non-smokers[a]	14 (15%)	28 (30%)	13 (12%)	43 (40%)

Note. Current non-smokers at baseline are those who had quit smoking within the six last weeks prior to the study start, while non-smokers at follow-up are those who reported to be non-smokers at the time they filled out the follow-up questionnaire.

Table 3. Change in smoking status from baseline to follow-up in treatment Compared to control group: Results from nine different analytical approaches.

	Coef.	Std. Err.	t-value	P	95% Conf. Interval	
Difference in proportion change						
LPM	−0.128	0.062	−2.06	0.041	−0.251	−0.005
LPM, Adj.	−0.181	0.084	−2.16	0.032	−0.346	−0.016
RE Logit	−0.156	0.062	−2.51	0.012	−0.278	−0.034
RE logit, Adj.[a]	−0.166	0.065	−2.55	0.011	−0.294	−0.038
LPM drop out = smoker, Adj.	−0.178	0.082	−2.17	0.031	−0.339	−0.016
Difference in log odds change						
RE Logit	−2.106	0.779	−2.70	0.007	−3.633	−0.580
RE Logit, Adj.	−2.527	0.861	−2.93	0.003	−4.215	−0.838
RE Logit imputed	−2.043	0.780	−2.62	0.009	−3.573	−0.514
RE Logit imputed, Adj.	−2.620	1.287	−2.04	0.052	−5.208	−0.040

Note. Negative coefficients reflect a stronger decrease in the number of smokers (occasional and daily smoking combined) in the Treatment group compared to the Control group.
[a]No adjustment for covariates by time (only main effects) because the complexity of a fully interacted made it difficult to calculate reliable marginal proportions. Abbreviations: Coef.: Regression Coefficient; Std.Err. : Standard Error; Conf. Interval : Confidence Interval; LPM: Linear Probability Model; Adj.: covariate adjusted; RE: Random Effect (Random intercept for patient ID).

breast and prostate cancer were the most prevalent types in both the control group and the treatment group.

The proportion of current daily smokers decreased in both study groups (Table 2). According to the main model, the decrease in smoking (daily and occasional smoking combined) was stronger in the intervention group than in the control group. The estimated effect of the program corresponded to a 13-percentage point increase in the smoking cessation rate (Table 3, first model). After adjusting for gender, age, education, labour market participation, partnership status, and hospital, the estimated difference increased to approximately 18 percentage points (Table 3, second model; and fully reported in Table 4). The differences in proportions calculated from the random effect logit models with and without covariate adjustments were similar to the results of the main model (Table 3, third and fourth models), 16 and 17%, respectively. The robustness check, where we assume that all non-responders at follow-up are smokers, was also consistent with the initial models (Table 3, fifth model), with an 18-percentage point increase.

In addition to calculating differences in proportion change, we also report coefficients of logistic models (differences in log odds change). The coefficients (intervention by time interaction terms) from the model without covariates, and from the model that fully interacted with all covariates with time, both indicated a stronger decrease in smoking in the intervention group (Table 3, first and second models of lower panel). The results from the logistic regressions on imputed data were similar to those of the former models (Table 3, last two models).

Discussion

This study found a positive estimated effect of offering a structured smoking cessation program based on Motivational Interviewing and cost-free Nicotine Replacement Therapy to

Table 4. Change in smoking status (1 = occasional or daily smoker, 0 = non-smoker) from baseline to follow-up regressed on treatment status and demographics.

	Coef.	Std. Err.	*t*-value	P	95% Conf. Interval	
Constant	*−0.510*	*0.371*	*−1.37*	*0.171*	*−1.242*	*0.222*
Treatment	−0.181	0.084	−2.16	0.032	−0.346	−0.016
Women	0.063	0.074	0.86	0.393	−0.083	0.209
Education						
Secondary	−0.042	0.096	−0.43	0.664	−0.232	0.148
Upper secondary	−0.164	0.114	−1.44	0.151	−0.389	0.061
Work status						
Working	0.076	0.089	0.85	0.398	−0.101	0.252
Retired	0.035	0.112	0.32	0.752	−0.186	0.256
Married/cohabiting	0.144	0.073	1.97	0.051	0.000	0.289
Age	0.002	0.005	0.32	0.750	−0.009	0.013
Hospital						
2	0.211	0.119	1.78	0.077	−0.023	0.445
3	0.128	0.147	0.87	0.386	−0.162	0.417
4	0.754	0.338	2.23	0.027	0.087	1.420
5	0.178	0.097	1.83	0.069	−0.014	0.369
6	0.487	0.160	3.04	0.003	0.171	0.804
7	0.282	0.126	2.24	0.027	0.033	0.530
8	0.247	0.146	1.69	0.093	−0.042	0.535

Coef.: regression coefficient; St. Err.: standard error; Conf. Interval : confidence interval.

cancer patients under treatment. Compared to the hospitals' standard smoking cessation care, the reduction in smoking in the intervention group was 13 percentage points and the difference was not attenuated after adjusting for gender, age, education, labour market participation and partnership status. Our results were consistent across a range of specifications and models, as well as under the assumption that all dropouts were smokers.

The positive effect on smoking in the intervention group in the current study is in line with some previous studies [19–21], while other studies have not shown similar results [22,23]. The variations in findings between studies might be attributed to different contents of the interventions in addition to differences in a variety of factors, such as the standard care in the comparison group (control group), type and severity of cancer diagnoses, age, cancer treatment paths, and study design. None of the previous studies can be directly compared to the current study as they differ in terms of program, study design, and inclusion criteria.

Strength and weaknesses

This is the first study to demonstrate the positive impact of a structured smoking cessation program based on Motivational Interviewing and cost-free nicotine replacement products to cancer patients in Norwegian hospital settings. It also stands as one of the few international investigations into this subject. The findings are highly relevant for smoking cessation strategies in cancer treatment in Norway and are also likely generalisable to similar settings, such as other Nordic countries. However, some weaknesses should be noted. First, study participants were not randomised to intervention and control groups. Instead, the recruitment to the intervention group began when the recruitment to the control group was finished. Factors and events that were different in the two time periods could have affected the results. The lack of randomisation may also produce groups that are different from each other due to changes in motivation among the cessation counsellors, changes in hospital personnel, or other administrative issues, as well as developments in cancer therapy and in the demography of cancer patients. The data indicated differences between the intervention and control groups in terms of education and retirement status. Furthermore, the type of patients that choose to participate in a research study without being offered a smoking cessation program (i.e., the control group) versus a research study with a cessation program may differ. The latter offer might be more appealing but perhaps also appear more effortful as it implies a stronger commitment to quitting.

Importantly, the study design controls for time-invariant confounders by measuring the change in smoking status. Thus, the results cannot be attributed to stable characteristics of the groups. These characteristics may however interact with time (e.g., affect the general inclination to quit after being diagnosed with cancer). According to the covariate adjusted analyses, the demographic characteristics that were measured in the study, including those that differed between groups (age, education, retirement status), did not appear to attenuate the estimated effect. Rather, the inclusion of covariates tended to slightly increase the effect size.

We did not achieve the predetermined sample size. This would have been a greater challenge for the interpretation of the study if we had obtained non-significant results in our statistical tests. It is important to note that the final sample size was not conditional on interim results. Statistical analyses were conducted by two of the authors, who were not involved in organising the study or the decision to halt recruitment, after recruitment was concluded. Future project in similar contexts could benefit from preliminary feasibility studies to establish a realistic recruitment plan.

Our analysis cannot differentiate between the effect of the Motivational Interview-based smoking cessation guidance and the distribution of free nicotine replacement products as they were offered together. Some hospitals also provide free nicotine replacement products to cancer patients in their standard smoking cessation programs, and in these hospitals the actual difference between the conditions in the control and the intervention group in the current study was the Motivational Interviewing part of the intervention, implying that the control group also partly received some of the content of the intervention. This fact might have attenuated the real effect of offering Motivational Interviewing combined with free nicotine replacement products compared to no smoking cessation treatment.

Conclusion

Offering a structured smoking cessation program based on Motivational Interviewing as well as cost-free nicotine replacement products to cancer patients in treatment can increase smoking cessation rates in comparison to standard smoking cessation care at the hospitals. Although we made no formal cost analysis, motivational interviewing and nicotine replacement therapy are relatively low-cost treatments in comparison to the substantial costs of cancer treatment

and inpatient care. As smoking is an important risk factor for cancer patients, the present results suggest that a structured smoking cessation program with motivational interviewing and nicotine replacement therapy can be a cost-effective measure that saves life-years while reducing costs.

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Data availability statement

The dataset includes sensitive personal information and is only accessible to researchers affiliated with NIPH and this specific project. An anonymized version of the data can be made available upon request to the corresponding author.

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Appendix A

Standard smoking cessation programs at the hospitals prior to the study.

Hospital	Type of program	Free NRP	If free NRP, types
St. Olav's University Hospital	Individual approach decided by the doctor	No	
Nordland Hospital Trust	Patients who smoke are informed about the negative effect from smoking on cancer treatment	Yes, if the patient is motivated to quit, they receive a small packet with NRP, but will have to buy if the wish to continue with NRP.	If smoking $<$ 20 cigarettes per day: • Nicotinell Lozenges 2 mg • Nicorette nicotine chewing gum 2 mg • Nicorette oral spray 1 mg • Non-nicotine chewing gum • Info about nicotine oral spray • Info about the NRPs • Nicotine addiction self-test – the patient can test which NRPs he/she should use. If smoking $\geq$ 20 cigarettes per day: • Nicotinell Lozenges 2 mg • Nicorette nicotine chewing gum 2 or 4 mg • Nicotine patches 4 mg • Nicorette oral spray 1 mg • Non-nicotine chewing gum • Info about nicotine oral spray • Info about the NRPs • Nicotine addiction self-test – the patient can test which NRPs he/she should use
Ålesund Hospital, Møre og Romsdal Hospital Trust	All smoking patients recieve smoking cessation packages	Yes	• Nicotinell Lozenges 2 mg • Nicorette nicotine chewing gum 2 or 4 mg • 2xNicotine patches 4 mg • Non-nicotine chewing gum • Brochure about smoking cesseation from Ålesund hospital • Brochure from different smoking suppliers
Haukeland University Hospital, Bergen Hospital Trust	All patients were asked of smoking status at appointment for imaging for treatment planning. Smokers received oral and written information on smoking and radiotherapy, along with a small package of NRP	Yes, a small package of NRP. Patients had to buy more NRP if they wish to continue.	Two alternative packages were offered, according to number of daily cigarettes: $<$ 20 cigarettes per day: • 2 Nicotine patches 14 mg / 24 h • 12 Nicorette nicotine chewing gums, 2 mg $>$ 20 cigarettes per day: • 2 Nicotine patches 21 mg / 24 h • 12 Nicorette nicotine chewing gums, 4 mg
Oslo University Hospital	Individual approach decided by the doctor	No	
Hospital of Southern Norway, South-Eastern Norway Regional Health Authority	Individual approach decided by the doctor	No	

NRP: Nicotine Replacement Product.

Appendix B

Type of nicotine replacement products in combination with Motivational Interviewing during the intervention.

Hospital	Type of nicotine replacement products and nicotine content (in addition to Motivational Interviewing)
St. Olav's University Hospital	• Nicotine patches (Nicotinell/Nicorette) 7 mg/ 24 h, 14 mg/24 h or 21 mg/24 h • Nicotinell chewing gum 2 mg • Nicotine lozenges (Nicotinell) 2 mg • Nicotine Mouth spray (Nicorette) 1 mg/dose • Nicotine inhaler (Nicorette), 10 mg/dose Type of NRP were given according to patient preference, nicotine strength according to number of cigarettes prior to quit smoking.
Nordland Hospital Trust	• Nicotinell lozenges 2 mg • Nicorette chewing gum 2 mg • Nicotinell chewing gum 4 mg • Nicotine pathes 4 mg
Ålesund Hospital, Møre og Romsdal Hospital Trust	• Nicotine patches (Nicotinell/Nicorette) 7 mg/ 24 h, 14 mg/24 h or 21 mg/24 h • Nicotinell chewing gum 2 mg • Nicotine lozenges (Nicotinell) 2 mg • Nicotine Mouth spray (Nicorette) 1 mg/dose • Nicotine inhaler (Nicorette), 10 mg/dose Type of NRP were given according to patient preference, nicotine strength according to number of cigarettes prior to quit smoking.
Haukeland University Hospital, Bergen Hospital Trus	• Nicotine patches (Nicotinell) 14 mg/24 h or 21 mg/24 h • Nicotine Chewing gum (Nicotinell) 2 mg or 4 mg • Nicotine Mouth spray (Nicorette) 1 mg/dose • Nicotine lozenges (Nicotinell or Zonnic)1mg, 2 mg or 4 mg • Nicotine inhaler (Nicorette), 10 mg/dose Type of NRP were given according to patient preference, nicotine strength according to number of cigarettes prior to quit smoking.
Oslo University Hospital	• Nicotine patches (Nicorette) 10 mg/16 h, 15 mg/16 h or 25 mg/16 h • Nicotine Chewing gum (Nicorette) 2 mg or 4 mg • Nicotine lozenges (Nicorette) 2 mg or 4 mg Type of NRP were given according to patient preference, nicotine strength according to number of cigarettes prior to quit smoking.
Hospital of Southern Norway, South-Eastern Norway Regional Health Authority	• Nicotine patches (Nicotinell/Nicorette) 7 mg/ 24 h, 14 mg/24 h or 21 mg/24 h • Nicotinell chewing gum 2 mg • Nicotine lozenges (Nicotinell) 2 mg • Nicotine Mouth spray (Nicorette) 1 mg/dose • Nicotine inhaler (Nicorette), 10 mg/dose Type of NRP were given according to patient preference, nicotine strength according to number of cigarettes prior to quit smoking.

Appendix C

Cancer Type	Control group (n)	Treatment group (n)
Bladder	4	5
Breast	54	64
Colon	13	13
Lung	60	62
Lymphoma	5	2
Pancreatic	2	2
Prostate	23	24
Rectal	3	5
Testicle	4	3
Other cancer types	22	48
Missing information	18	4

[a]By self reports.