

Original Research

A brief motivational interview for smoking cessation by Belgian community pharmacists

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Abstract

Background: Community pharmacy-delivered interventions for smoking cessation are effective. The impact of behavioural interventions on short-term health benefits remains unclear. **Objective:** We aimed to evaluate a community pharmacy-delivered motivational interview for smoking cessation with characterization of the population that can be reached and assessment of the association between the motivation to quit smoking and short-term health benefits. **Method:** Demographics of smokers approached during a Flemish community pharmacy-delivered encouragement for smoking cessation in the months May-June 2021, their motivation to quit and dispensing records were retrieved from the pharmacy database. The use of pharmacotherapeutic smoking cessation aids and inhalers, cough medicines, antibiotics and oral corticosteroids (proxies for short-term health benefits) was evaluated 90 and 180 days after the interview. Data were analysed using the Mann-Whitney U test, χ^2 test and binary logistic regression analysis. **Results:** Community pharmacists provided a brief motivational interview to a broad population ($n=300$), including young persons and persons without chronic medication use. Two out of three were motivated to quit (67.7%) and a third (33.0%) purchased a smoking cessation aid on the index date (36.7% after 90 and 39.3% after 180 days). Smokers motivated to quit and purchasing a smoking cessation aid on the index date, had a significantly lower use of cough (OR = 0.37; $p = 0.032$) and inhaler medication (OR = 0.37; $p = 0.009$) after 90 days than those not motivated to quit. Effects were less pronounced after 180 days but still statistically significant for lower inhaler use (OR = 0.46; $p = 0.031$). **Conclusion:** By implementing a brief pharmaceutical counselling for smoking cessation in Belgian community pharmacies, a broad range of smokers can be reached, motivated to quit and triggered to start smoking cessation aids. A motivation to quit is associated with suggestive short-term health benefits.

Keywords: smoking cessation; smoking cessation Agents; tobacco use cessation devices, community pharmacy service, patient education as topic; motivational interviewing

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What is already known on this topic? It is shown that community pharmacists, in addition to other healthcare providers, may play an important role in finding new ways to stimulate smoking cessation. Community pharmacy-delivered interventions for smoking cessation, both for behavioural support as for advice on the correct use of smoking cessation products, are (cost-)effective in comparison to usual care.

What this study adds? A broad population of smokers can be reached by a community pharmacy-delivered motivational interview for smoking cessation, including young people and people without use of chronic medication. Almost 7 out of 10 are motivated to quit and approximately one out of three purchased a pharmacotherapeutic smoking cessation aid at the day of the interview. After the interview, the use of cough medication and inhaler medication was significantly lower in people motivated to quit compared to not motivated people, suggesting an association between a motivation to quit smoking and short-term health benefits.

How this study might affect research, practice or policy? Community pharmacist are able to approach a broad range of smokers and may act as a first point of contact and an orientation centre to guide people to a smoke-free life. The association between a motivation to quit smoking and short-term health benefits requires further investigation.



INTRODUCTION

Tobacco smoking is a major cause of preventable morbidity and mortality.¹ It is related to an increased risk of cancer, respiratory diseases, diabetes, cardiovascular diseases and stroke.²⁻⁸ This results in elevated healthcare costs for the patient on the one hand and in high economic costs, such as productivity losses and healthcare expenditures for related morbidity on the other hand.⁹⁻¹³ Worldwide, more than 8 million smoking-related deaths are yearly counted¹. In Belgium, the prevalence of smoking fluctuates around 15%.^{14,15}

Numerous initiatives to reduce smoking have been rolled out and researched.^{1,16-19} Both medication to support quitting and (individual) behavioural interventions have proven to increase the chance of successful cessation.^{1,16-19} It is shown that community pharmacists, in addition to other healthcare providers, may play an important role in finding new ways to stimulate smoking cessation. Community pharmacy-delivered interventions for smoking cessation, both for behavioural support as for advice on the correct use of smoking cessation products, are (cost-)effective in comparison to usual care.²⁰⁻²³ Moreover, in some countries (e.g. Belgium), medication to support quitting is only available in community pharmacies. Whether smoking cessation encouragement by community pharmacists in Belgium can motivate a broad population to quit, requires further investigation.

Additionally, the positive impact of smoking cessation on health is well known.²⁴ However, it is, to the best of our knowledge, unknown if a motivation to quit smoking can be associated with short-term health benefits such as cough reduction and less inhaler need. Therefore, the overall aims of this study were to evaluate a community pharmacy-delivered encouragement for smoking cessation (in terms of perceived outcomes of a brief motivational interview and dispensed pharmacotherapeutic smoking cessation therapy) with characterization of the potential population that community pharmacists can reach and assessment of the association between the motivation to quit smoking and short-term health benefits.

METHODS

Pharmacotherapeutic smoking cessation therapies

Belgium is characterized by one of the densest network of community pharmacies in Europe, with one community pharmacy per 2150 inhabitants, making the community pharmacist one of the most accessible healthcare provider.²⁵ Pharmacotherapeutic smoking cessation therapies (nicotine replacement therapy (NRT), bupropion and nortriptyline) are, in Belgium, only available in community pharmacies and generally not reimbursed. NRT is available over-the-counter, while the other pharmacotherapeutic smoking cessation therapies are subject to medical prescription. Cytisine is not commercialized in Belgium and varenicline is withdrawn and unavailable since June 2021. Bupropion is reimbursed for smoking cessation only in adults aged over 35 years, suffering from chronic obstructive pulmonary disease (COPD) and

following professional coaching.

Community pharmacy-delivered encouragement for smoking cessation

In the light of World No Tobacco Day (31st of May 2021), a community pharmacy campaign on smoking cessation was initiated by the Flemish Pharmacists Network (VAN). On May 3rd 2021, 435 community pharmacists followed an online lecture about the societal urgency for smoking cessation, non-pharmacological behavioural support techniques (such as tips and tricks for brief motivational interviewing) and pharmacotherapeutic smoking cessation therapies. At the end of the lecture, there was a briefing about the current project and its data registration aspects. Subsequently, VAN sent additional materials (flyers, posters, etc.) by postal mail to all its 1887 members with the goal to make smoking cessation support more visible.

During May and June 2021, community pharmacists were encouraged to approach on own initiative smokers who visited their pharmacy. The target population were current smokers who not already recently tried to quit smoking (e.g. no pharmacological smoking cessation therapy or use of NRT in the last 6 months before the pharmacy visit or self-care demand for a NRT). Community pharmacists were asked to offer a brief motivational interview on smoking cessation to eligible visitors. They could voluntarily register their smoking cessation support practices via the pharmacy software by using four different barcodes. The barcode used depended on the perceived outcome of the brief motivational interview: (1) not motivated - the person is not ready to take any action, (2) motivated with referral - the person agrees with referral to a counsellor for further smoking cessation advice (e.g. general practitioner (GP), recognized smoking cessation advisor or free tobacco telephone service), (3) motivated without aid - the person expresses a will to try to quit without aid (cold turkey and/or without pharmacotherapy), (4) motivated with pharmacotherapeutic aid - the person is motivated to quit and purchased, or plans on purchasing, a pharmacotherapeutic smoking cessation therapy. The motivational interview was offered within standard pharmaceutical care and of no charge as this service is not yet recognized nor reimbursed by the National Institute for Health and Disability Insurance (NIHDI) in Belgium.

At the end of the project, Farmaflux (a mandated organization, collecting and processing real-time dispensing data along with persons' demographics from all community pharmacies in Belgium) provided the requested data for our study population, e.g. data from all persons for whom a barcode, as proxy of the perceived outcome of the brief motivational interview, was registered. Requested data included: the specific registered barcode, persons' demographics (age, registered sex) at the index date and their dispensing records of pharmacotherapeutic smoking cessation therapies (NRT, varenicline, bupropion and nortriptyline) and specific drugs (both dispensed over-the-counter or with medical prescription; limited to inhalers for obstructive airway diseases (Anatomical Therapeutic Chemical (ATC) R03), cough medication (ATC R05), antibiotics (ATC J01),



oral corticosteroids (ATC H02), antihypertensives (ATC C02, C03, C07, C08 and C09), antithrombotic agents (ATC B01), drugs used in diabetes (ATC A10) and cholesterol inhibitors (ATC C10)) for the period of 90 days before the index date up to 180 days after the index date. The index date was defined as the first registration of a barcode for the motivational interview during the months May/June 2021. Smokers who purchased a pharmacotherapeutic smoking cessation therapy (at any pharmacy in Belgium) during the 90 days before the index date, were excluded. The study used fully de-identified anonymized aggregated claims data for analyses and therefore ethics approval deemed unnecessary according to the national legislation (the Belgian Personal Data Protection Act (30th July 2018 – 2018/40581)) and the European legislation (GDPR (e.g. 2016/679 – art. 5 and art. 89)).

Data analysis

People with barcodes 2, 3 or 4 were categorized as “motivated to quit smoking”. Baseline medication use was defined as the use of at least one drug (limited to inhalers for obstructive airway diseases, antihypertensives, antithrombotic agents, drugs used in diabetes and cholesterol inhibitors; ATC categories mentioned above) in the 90 days before the index date. Short-term health benefits after the motivational interview were evaluated indirectly by analysing the dispensing of cough medicines (ATC R05), inhalers (ATC R03), antibiotics (ATC J01) and oral corticosteroids (ATC H02) during follow-up (up to 180 days after the brief motivational interview).

Statistical analysis

Mann-Whitney U test, χ^2 test and binary logistic regression analysis were used to compare persons’ characteristics, the proportion of baseline medication users and the purchase of smoking cessation therapies within 180 days after the community-delivered motivational interview. Differences in short-term health benefits (evaluated indirectly by the dispensing of cough medicines, inhalers, antibiotics and oral corticosteroids during follow-up) were analysed between the group “motivated to quit smoking” and the not motivated

group, with a subgroup analysis of people motivated to quit purchasing smoking cessation therapy on the index date. Not motivated smokers purchasing smoking cessation therapy afterwards were excluded for the analyses on short-term health benefits. Analyses were performed both unadjusted and adjusted (age, registered sex, baseline inhalers medication use). A p-value < 0.05 was considered significant and data analyses were performed using IBM SPSS Statistics version 27 (Armonk, New York, USA).

RESULTS

One-hundred and one unique community pharmacists registered a total of 300 motivational interviews during the campaign period, involving a population with a median age of 53 years consisting of 50.0% females (150 out of 300). The age range of the approached people ranged was broad (73 years). Half of the approached visitors (150 out of 300, 50.0%) used at least one of the medication classes assessed at baseline, whereby antihypertensives (89 out of 300, 29.7%) and cholesterol inhibitors (61 out of 300, 20.3%) were the most frequently used. Baseline characteristics are presented in Table 1.

Perceived outcomes of the brief motivational interview

Smoking cessation was considered by 203 people (67.7%), with 30.3% (n = 91) considering to quit smoking by using a smoking cessation aid, 29.7% (n = 89) opting for a referral to a counsellor and 7.7% (n = 23) trying to stop cold turkey. The group “motivated to quit smoking” and the not motivated group differed significantly in age and baseline inhalers medication use. Figure 1 shows the motivation to quit smoking categorized by age category.

Use of pharmacotherapeutic smoking cessation aids

Of the 300 people addressed, 99 (33.0%, 48.5% women) purchased smoking cessation therapy the same day of the brief motivational interview. This percentage slightly increased

Table 1. Baseline characteristics of the motivated group versus not motivated group						
	Motivated group (n = 203)				Not motivated group	p-value ¹
	Motivated with pharmacotherapeutic aid (n = 91)	Motivated with referral (n = 89)	Motivated without aid (n = 23)	Total “motivated to quit smoking” group (n=203)	No motivation to quit (n = 97)	
Age (years), median (age range)	53 (67)	52 (70)	60 (53)	53 (73)	57 (67)	0.031
Female, n (%)	40 (44.0%)	51 (57.3%)	9 (39.1%)	100 (49.3%)	50 (51.5%)	0.768
Baseline medication users, n (%)	43 (47.3%)	40 (44.9%)	12 (52.2%)	95 (46.8%)	55 (56.7%)	0.464
Inhalers	11 (12.1%)	15 (16.9%)	4 (17.4%)	30 (14.8%)	27 (27.8%)	0.019
Antihypertensives	28 (30.8%)	24 (27.0%)	8 (34.8%)	60 (29.6%)	29 (29.9%)	0.406
Antithrombotic agents	17 (18.7%)	11 (12.4%)	4 (17.4%)	32 (15.8%)	21 (21.6%)	0.561
Drugs used in diabetes	6 (6.6%)	9 (10.1%)	4 (17.4%)	19 (9.4%)	10 (10.3%)	0.830
Cholesterol inhibitors	16 (17.6%)	17 (19.1%)	5 (21.7%)	38 (18.7%)	23 (23.7%)	0.707
¹ p-values are displayed for the differences in characteristics between the total “motivated to quit smoking” group and the not motivated group and derived from models adjusted for age and sex (except the p-value for age which was adjusted for sex only, and the p-value for sex adjusted for age only). Significant estimates (p < 0.05) are indicated in bold.						



up to 36.7% (n = 110) and 39.3% (n = 118) after 90 and 180 days, respectively. The proportion of pharmacotherapeutic smoking cessation therapy purchasers during follow-up (index till 180 days after the motivational interview) was significantly higher in the group “motivated to quit smoking” compared to not motivated people (55.7% vs 5.2% respectively, $p < 0.001$) (Figure 2).

In the group motivated to quit with pharmacotherapeutic aid, 72.5% (66 out of 91) purchased smoking cessation therapies on the day of the motivational interview. Additionally, 36.0% (32 out of 89) of the group motivated to quit with referral purchased smoking cessation therapy on the index day. The purchases in the groups motivated without aid or the not motivated group happened in the 90 days or in the 180 days after the community pharmacy-delivered motivational interview for smoking cessation (Figure 2). Nicotine replacement therapy (NRT) was the most purchased smoking cessation therapy (n = 105, 89.0%). The only other smoking cessation therapy purchased was varenicline (n = 14, 11.9%).

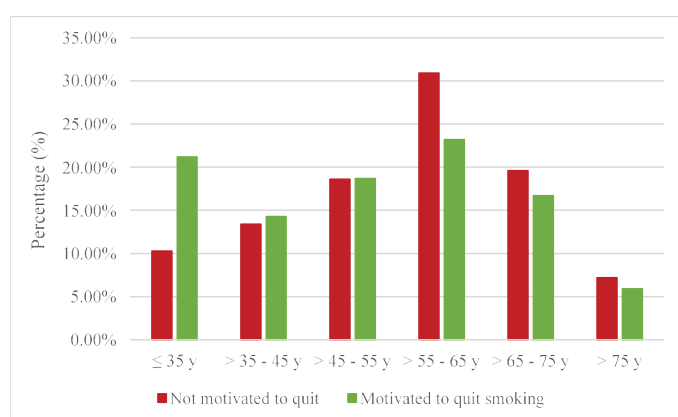
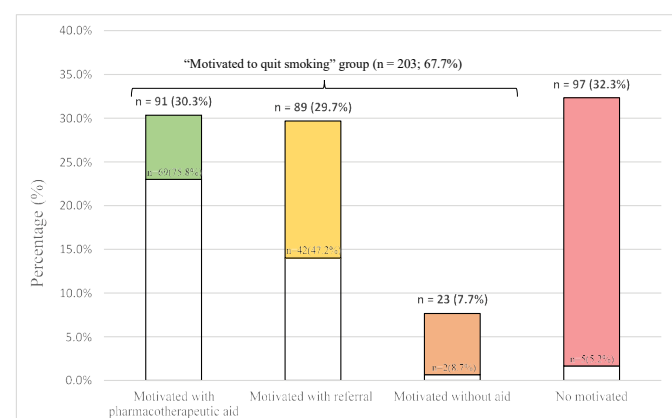


Figure 1. Motivation to quit smoking categorized by age categories



The darker shaded dotted areas represent the proportion of persons, purchasing at least one smoking cessation therapy within 180 days after the motivational interview (absolute number with percentage)

Figure 2. Included smokers categorized by their motivation after the motivational interview

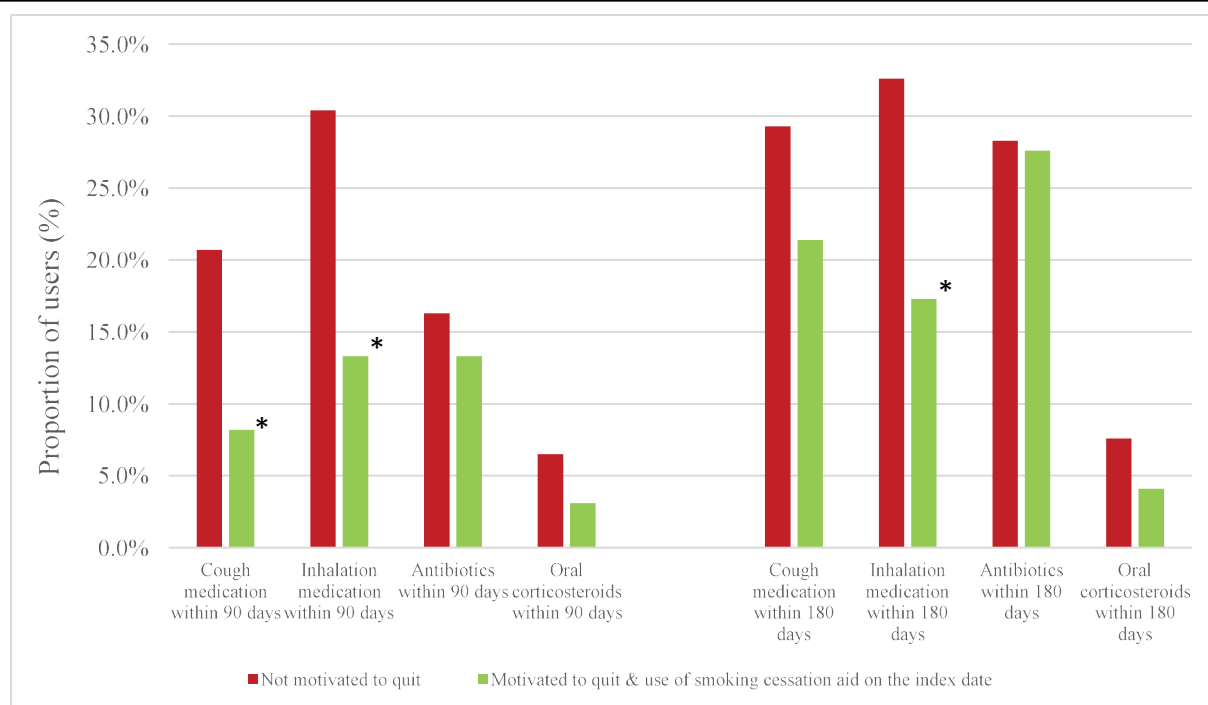
Association of motivation to quit smoking and medication use

The proportion of cough medication users was significantly lower among the group “motivated to quit smoking” (n = 203) than the not motivated group (n = 92) after 90 days in unadjusted analysis (90 days: $OR_{unadjusted} = 0.49$; 95% CI 0.25:0.96; $p = 0.036$), but no longer significantly lower when adjusted for age, sex and baseline inhaler use (90 days: $OR_{adjusted} = 0.58$; 95% CI 0.29:1.16; $p = 0.124$). No significant difference in proportion of cough medication users were observed at 180 days (180 days: $OR_{unadjusted} = 0.79$; 95% CI 0.45:1.37; $p = 0.393$; 180 days: $OR_{adjusted} = 0.89$; 95% CI 0.50:1.56; $p = 0.677$). The proportion of inhaler medication users was significantly lower among the motivated than the not motivated group at 90 days (90 days: $OR_{unadjusted} = 0.43$; 95% CI 0.24:0.77; $p = 0.004$) and at 180 days (180 days: $OR_{unadjusted} = 0.49$; 95% CI 0.28:0.86; $p = 0.013$), but was no longer statistically significant after adjustment for differences in age, sex and the proportion of inhaler users at baseline (90 days: $OR_{adjusted} = 0.58$; 95% CI 0.23:1.45; $p = 0.245$ and 180 days: $OR_{adjusted} = 0.76$; 95% CI 0.32:1.81; $p = 0.534$). No significant differences were found in the proportion of antibiotic or oral corticosteroid users.

Subgroup analysis revealed that the effect on cough and inhaler medication was primarily driven by people motivated to quit purchasing smoking cessation therapy on the index date (n = 98). Figure 3 illustrates the potential short-term health benefits for this group compared to those not motivated to quit after the motivational interview by community pharmacists. A significantly lower proportion of cough medication (90 days: $OR_{adjusted} = 0.37$; 95% CI 0.15:0.92; $p = 0.032$) was dispensed within 90 days, but the difference was no longer statically significant at 180 days post index date (180 days: $OR_{adjusted} = 0.72$; 95% CI 0.37:1.41; $p = 0.334$). Comparing the same groups, a significantly lower proportion of persons were dispensed inhalers in the 90 and 180 days post index date (90 days: $OR_{age\ and\ sex\ adjusted} = 0.37$; 95% CI 0.18:0.78; $p = 0.009$ and 180 days: $OR_{age\ and\ sex\ adjusted} = 0.46$; 95% CI 0.23:0.93; $p = 0.031$), however the difference was no longer statically significant at 180 days post index date when additionally adjusted for existing differences in the proportion of inhaler users at baseline (90 days: $OR_{adjusted} = 0.30$; 95% CI 0.09:0.96; $p = 0.042$ and 180 days: $OR_{adjusted} = 0.48$; 95% CI 0.16:1.44; $p = 0.188$). Analogously as for the whole group analysis, effects were less pronounced and not statistically significant for antibiotic or oral corticosteroid use.

DISCUSSION

This study evaluated a brief community pharmacy-delivered motivational interview for smoking cessation, discussing smoking behaviour, motivation to quit and the different options to quit smoking. Community pharmacists reached 300 smokers with a broad age range, of which half did not use a chronic medication in the 90 days before the motivational interview. Almost 7 out of 10 expressed a motivation to quit. At the day of the motivational interview, approximately one out of three addressed visitors purchased smoking cessation therapy. During a 90-day period (~3 months) after the motivational



* represents a significant difference ($p < 0.05$) in age and sex adjusted analysis

Figure 3. Visualization of the proportion of medication users after the brief motivational interview

interview, the use of cough medication and inhaler medication was significantly lower in people motivated to quit compared to not motivated people. Subgroup analysis of smokers with motivation to quit and purchasing smoking cessation therapy on the index date revealed a prolonged effect at 180 days (~6 months), suggesting an association between the motivation to quit smoking and short-term health benefits.

During the two-month campaign period, community pharmacists were able to reach a broad spectrum of smokers. Indeed, both younger and older persons were represented (age range of 73 years) as well as both male and female smokers (equally distributed over both sexes). The ability to reach younger people is valuable, as smoking cessation is particularly beneficial at younger ages.²⁶ In addition, even smokers without specific chronic medication use (50.0%), who are assumed to visit a GP less frequently, were well presented in this study. Community pharmacists seem therefore able to approach a broad range of smokers and act as a first point of contact and an orientation centre to guide people to a smoke-free life.

More than two out of three approached visitors were motivated to quit. This corroborates with previous research in Belgium^{27,28} and internationally.^{29,30} The median age of the group not motivated to quit was significantly different compared to the group “motivated to quit smoking”, whereby older people were less motivated to quit, analogously as observed previously,^{28,30-32} however not in all studies.^{33,34} It is suggested that older adults who smoke do not perceive any further benefit of quitting (‘the harm is already done’) or any

harm of smoking at their advanced age.³⁰⁻³² Interestingly, the percentage of inhaler medication users at study inclusion was higher in the not motivated group. Though, this group represents an important symptomatic group for smoking cessation as primary or secondary prevention, e.g. preventing development or aggravation of asthma or COPD.⁴ It can be suggested that these patients might require more extensive counselling on smoking cessation since these lung diseases are frequently associated with anxiety and depression besides low self-efficacy.^{35,36}

In this study, more than one out of three started a pharmacotherapeutic smoking cessation therapy within 180 days after the community pharmacy-delivered motivational interview. Similar studies on the purchase of smoking cessation therapies after community pharmacists counselling are scarce, with mentioning of both lower³⁷ and higher³⁸ proportions of smoking cessation therapy purchased. The observation that the vast majority of smoking cessation therapy were purchased on the index date is important. The motivation to quit smoking can fluctuate over time and a deterioration of the effect of motivational interviewing on the motivation to quit smoking can be expected after a while.³⁹⁻⁴¹ In the current study, it is possible that the immediate access to smoking cessation therapy following the motivational interview by the community pharmacist prevented people who are motivated to quit smoking to delay their smoking cessation attempt. It is encouraging that more than 75% of the people motivated to quit with smoking cessation aids and almost half of those with a motivation to quit with referral to a counsellor obtained a

smoking cessation aid within 180 days after the motivational interview. Surprisingly, some people initially only motivated to stop without aid or even not motivated for smoking cessation at the index date, did nevertheless purchase a smoking cessation aid during the 180-day follow-up. This suggests that a brief motivational interview, initially considered unsuccessful may still trigger a quit attempt in the future. Other (medical) triggers for smoking cessation can however not be ruled out.

NRT was the most frequently dispensed smoking cessation therapy. This is not unexpected, as all other pharmacotherapeutic smoking cessation therapy available in Belgian community pharmacies require a prescription. A recent Cochrane review supports the use of combination NRT above single-form NRT.⁴² As we only differentiated between users and no users, no statements on the use of single-form or combinations of NRT can be made.

A trend to lower cough and inhaler medication use in the group “motivated to quit smoking” compared to the not motivated group, was observed at 90 days. Subgroup analysis revealed the effect on medication use was mainly driven by smokers motivated to quit who purchased smoking cessation therapy on the index date. These results may suggest an association between a motivation to quit smoking and short-term health benefits, whereby the community pharmacy-delivered motivational interview triggers a ‘healthy’ adherer effect. However, as actual quitting rates were unavailable, these results have to be interpreted with caution. The trend to a lower use of cough medication diminished at 180 days post index but was still significant for inhaler medication use. A deterioration of the positive effect of the motivational interview over time might have been present resulting in some smoking relapse, while long-term benefits are still expected for those who were able to successfully quit.⁴³⁻⁴⁵

This research is to our knowledge the first to explore a community pharmacy-delivered motivational interview for smoking cessation in Belgium and the impact on medication use as proxy for short-term health benefits. Another strength of this research is the use of objective medication data based on pharmacy records. All pharmacotherapeutic smoking cessation therapies used during follow-up were captured as these aids are only available in the community pharmacy in Belgium. Despite the advantages of this pragmatic approach, there was no control on the quality of how this interview was performed in community practices. The training of the pharmacists was limited to a group lecture, without one-on-one training or evaluation of the motivational interview technique. It is possible that there was a big difference in quality/detail of the motivational interview between different community pharmacists. Yet, this reflects real-life practice in the best way and the motivation to quit after the motivational interview was high. Possible barriers to implement more extensive behavioural support interventions in the community pharmacy are a lack of educational materials and training, time and specific cessation programs.⁴⁶⁻⁴⁹ By organizing an one-evening training about smoking cessation (aids) and motivational interviewing, and by offering additional flyers and posters, the Flemish Pharmacists

Network (VAN) tried to overcome some barriers and supported community pharmacists to implement a brief motivational interview to quit smoking in daily practice. Secondly, there was no control to whom these interviews were offered as the community pharmacists decided when to start a motivational interview and voluntarily registered their practices. It is very likely that all smokers attending the pharmacy during the campaign period were approached. Furthermore, as there was no control on the registration, it is possible that the group of not motivated to quit is underestimated in this study, creating a too optimistic representation of real-life practice. However, the percentage motivated to quit did seem in line with literature.^{27,29,30} This study was additionally limited by the lack of insights in the success rates of the smoking cessation after the brief motivational interview by the community pharmacists and in the number of past attempts (beyond the last 6 months) of the approached people. The smoking and quitting history are valuable predictors for the motivation to quit and the success of quitting.³⁴ No conclusions on the persistence of use could be drawn as a distinction between quitting and smoking relapse during follow-up could not be made. Nevertheless, it can be assumed that the motivational interview by community pharmacists motivated several people to quit. Finally, as we could not control for many confounders influencing medication use (such as disease severity, physician treatment decisions or a lack of treatment in case of cough), the association between a motivation to quit and short-term health benefits has to be interpreted with caution and does not proof present causality.

Further research to assess the duration of the effect of and to better quantify the impact of brief community pharmacy-delivered motivational interview for smoking cessation by Belgian community pharmacists is required. The association between a motivation to quit and short-term health benefits or health-related quality of life needs to be further investigated.

CONCLUSION

In summary, a community pharmacy-delivered motivational interview for smoking cessation was able to reach a population, with a broad age range of which half did not use chronic medication. More than two out of three were motivated to quit. One third purchased pharmacotherapeutic smoking cessation therapy on the day of the interview, increasing to 40% within 180 days. A lower use of cough medication and inhaler medication was observed in the group motivated to quit. This effect sustained for inhaler medication use at 180 days in the subgroup of people purchasing smoking cessation therapy at the index date, suggesting an association between a motivation to quit and short-term health benefits.

DECLARATIONS

Ethics approval and consent to participate

All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained by the community pharmacists from all participants or, if



participants are under 18, from a parent and/or legal guardian, to receive healthcare services as well as to data sharing to Farmaflux. The study used fully de-identified anonymized aggregated claims data for analyses and therefore ethics approval deemed unnecessary according to the national legalisation (the Belgian Personal Data Protection Act (30th July 2018 – 2018/40581)) and the European legalisation (GDPR (e.g. 2016/679 – art. 5 and art. 89)).

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available upon request to the corresponding authors with permission of Farmaflux, but restrictions apply to the availability of these data, and therefore this data is not publicly available.

AUTHORS' CONTRIBUTIONS

L.L. was responsible for the study concept and design. L.L. and D.V. drafted the manuscript and performed data analyses. E.T. critically reviewed the manuscript. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

Outside this manuscript, E.T. received a consultancy fee by Johnson and Johnson and has given a lecture sponsored by Johnson and Johnson. Outside this manuscript, L.L. received a consulting fee paid to her institution from AstraZeneca, has given a lecture sponsored by Chiesi and lectures sponsored by IPSA vzw, a non-profit organization facilitating lifelong learning for health care providers. L.L. is an unpaid member of European Respiratory Society and Belgian Respiratory Society, member of Faculty board of Ghent University – Faculty of Pharmaceutical Sciences and faculty committees. None of which are related to the content of this work. All other authors declare no competing interests.

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