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Review: Long-term effect of perioperative smoking cessation programmes

Hanne Tønnesen & Thordis Thomsen

Abstract

Background Preoperative smoking cessation programmes have been reviewed recently regarding the immediate effect on postoperative complications and smoking habits. The objective of this review was therefore to evaluate long-term effects of perioperative smoking cessation programmes.

Methods PubMed, Cochrane, Embase, CINAHL databases were searched for randomised clinical trials on perioperative smoking cessation intervention programmes that included follow-up for smoking. The literature was evaluated and data were extracted from the included papers. The review involved meta-analyses.

Results The 10 included RCTs were presented in 12 papers and communications, involving 1,369 patients. Only 5 RCTs had a follow up of 12 months. The RR in the perioperative period was 1.90 (95% CI: 1.65 to 2.18), and after 12 months 1.57 (1.09 to 2.26). The subgroup analyses of the intensive 6-8 weeks programmes revealed a high RR of 5.89 (3.49 to 9.93).

Conclusion Smoking cessation intervention programmes were effective on short and long-term. The intensive programmes of six to eight weeks duration seemed to be most effective.

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Introduction

The association between smoking and postoperative complications is well established (10;11) and more than three hundred papers have been published since dr. Morton first described the increased risk of pulmonary problems in smokers compared to non-smokers in 1944 (12). However, the first randomised clinical trial (RCT) on smoking cessation in relation to surgery was published more than fifty years later (11;13). It was soon followed by eight more RCTs and further ongoing studies are to be published in the coming years, all together gathering substantial knowledge on the effect of different smoking cessation programmes in the perioperative period (14).

Preoperative smoking cessation programmes have been reviewed recently regarding the immediate effect on postoperative complications and smoking habits (11;14-16). However, a possible long-term effect and related prognostic factors still needed to be investigated further. The aim of this review was therefore to evaluate long-term effects of perioperative smoking cessation programmes.

Material

The inclusion criteria were RCTs on perioperative smoking cessation interventions among smokers undergoing surgery and postoperative follow up for smoking cessation. The programme should involve personal contact; it could be brief or intensive intervention, with or without pharmacotherapy. The control group could receive treatment as usual or placebo.

In total, 10 trials were identified and presented in 12 papers including 4 papers on long-term follow-up on original trials (2;4;29;30). Two trials did not distinguish between smoking reduction and smoking cessation in the outcome data, and were therefore excluded (27;28).This review included 10 trials for further evaluation; the trial profile is given in figure 1.

The main outcome measurement was smoking cessation up to one year after the intervention, either continuous or point prevalence.

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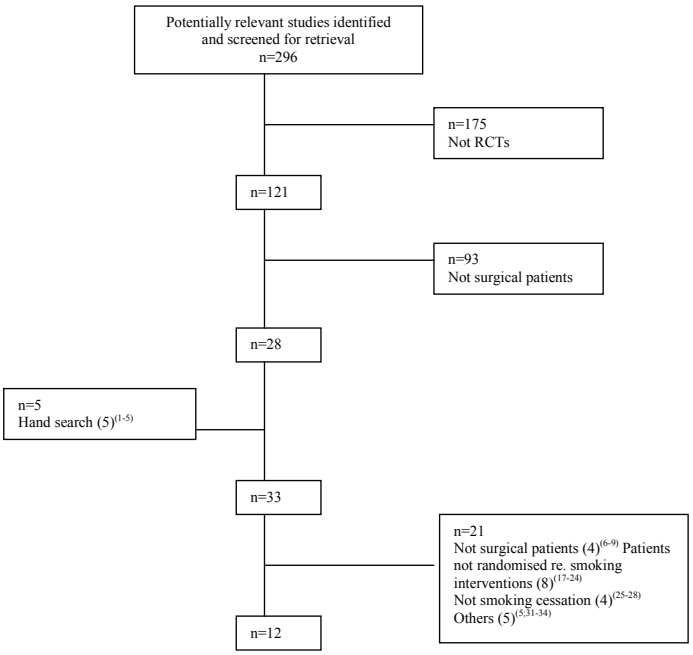
Figure 1 Trial profile for the systematic review



Methods

A systematic literature search was performed in the databases PubMed, Embase, CINAHL and the Cochrane Library; supplemented by hand search. There was no time or language restriction. The search strategy included participants (smoking OR tobacco use disorder) AND intervention OR smoking cessation OR tobacco use cessation OR smoking intervention OR tobacco use intervention OR smoking counselling OR tobacco use counselling OR patient education OR preoperative care OR perioperative care OR preoperative preventive care OR perioperative preventive care OR health promotion program OR preoperative health promotion program OR perioperative health promotion program) AND relation to surgery (surgery OR operation OR surgical procedure OR perioperative intervention OR postoperative complication* OR intraoperative complication*).

The search included RCTs as well as clinical controlled trials (CCT), and reviews with or without meta-analysis in order not to overlook weakly defined RCTs; the only limit was 'all adults'.

The quality of the studies was evaluated through the Cochrane Collaboration's tool for assessing risk of bias (35).

Data from the 10 RCTs were extracted regarding number of participants, follow-ups and drop outs, types of intervention and control programmes, quit rates and validation as well as regarding risk of bias; sequence generation, allocation concealment, blinding, incomplete data, selective reporting and other bias.

Mantel-Haenszel methods were used to calculate risk ratios (RRs) and corresponding 95 per cent confidence intervals (CI). RRs were calculated using available case analysis (35).

Metaanalyses were performed using the fixed effect method. Heterogeneity among studies was calculated using the I^2 statistic describing the percentage of the variability in effect estimates, which is due to heterogeneity rather than sampling error. Metanalyses were performed only if the I^2 of heterogeneity was below 40%.

Subgroup analyses were conducted according to the intensity of the smoking cessation programmes; brief intervention (BI) and intensive intervention (II) in 4-8 weeks programmes, with and without nicotine replacement therapy (NRT), bupropion and varenicline; the setting (intervention with and without relation to the surgical setting); and study quality (high and low). Review Manager (RevMan) version 5.0 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark) was used for data analysis. The results were presented as risk rates (RR) and 95% confidence interval (95% CI) (35).

Results

The 10 included trials involved 1,369 patients from Denmark, Sweden, United Kingdom, Australia, Canada and the US. The characteristics are described in table 1.

The risk of bias was relatively low, because all trials reported adequate sequence generation and allocation concealment, and they were free from selective reporting or other bias. All trials reported intention to treat analyses. However, four trials were unclear about the blinding procedure (3;4;29;36), two did not clearly address incomplete outcome data (36;37), and two reported point abstinence from smoking instead of continuous abstinence (38;39).

Four trials included 12 months follow-up, three trials for 3 and 6 months respectively.

The analyses showed significant quit rates on short term preoperatively and immediately postoperatively in 7 of 9 studies (Figure 2, a). However, the quit rates reduced over time with the exception of the studies that tested intensive interventions (figure 2 b,c,d,e).

Only the quit rates of the 6-8 weeks intensive inter-

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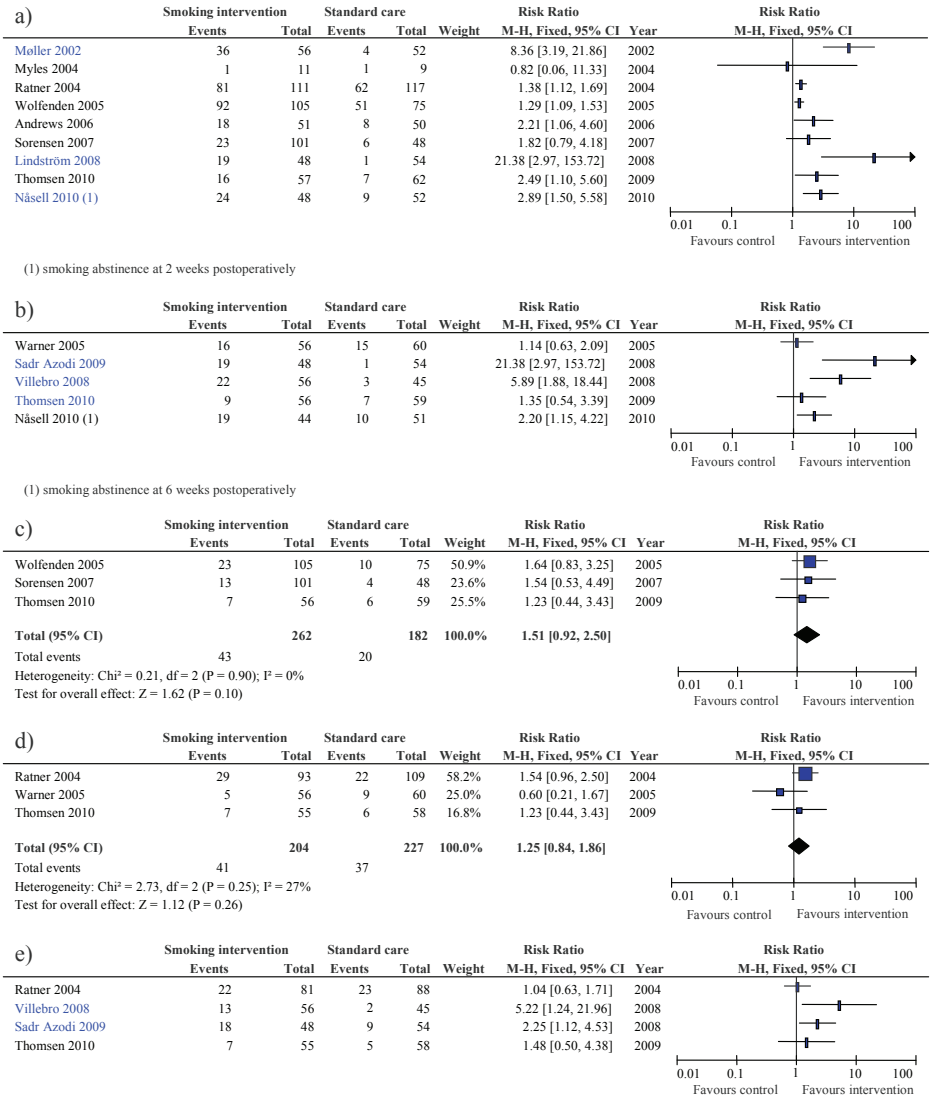
Table 1 Characteristics of the included 10 trials presented in 12 papers/communications.

References	Preop. smoking cessation program	Duration (Weeks)	Validation	No. of patients	No. of drop-outs	Follow-ups (Months post)
Thomsen et al. 2010(2)	BI + NRT	1-2	Yes	130	17	Peri 1+3+6+12
Sadr Azodi et al. 2009(29) +Lindström et al. 2008(40)	II + NRT + hotline	4	Yes	117	19 15	Peri 1+12
Nåsell et al. 2010(1)	II + NRT + hotline	8	Yes	105	11	Peri 1½
Villebro et al. 2008(4) + Møller et al. 2002(13)	II + NRT	6-8	Yes	120	19 12	Peri 1+12
Sørensen et al. 2007(36)	BI (telephone) + NRT	1	Yes	180	31	Peri 3
Andrew et al. 2006(3)	BI (letter)	4	No	102	1	Peri
Warner 2005(47)	NRT	0	No	121	5	1+6
Wolfender 2005(39)	BI (computer and telephone) + NRT	1-2	No	210	29	Peri 3
Myles 2004(37)	Bupropion + BI (telephone)	7	Yes	47	23	Peri
Ratner 2004(30)	BI	1-3	Yes	237	69	Peri 6+12

BI = brief intervention. II = intensive intervention. NRT = nicotine replacement treatment. Peri = perioperative. Post = postoperative

Figure 2 Results of preoperative smoking cessation programmes on quit rates in the perioperative period (a), and at follow up after I (b), 3 (c), 6 (d), and 12 (e) months. The blue colour reflects the intensive programmes.



vention programmes stayed significant during the total follow-up period (figure 2). Accordingly, the subgroup analyses of the intensive programmes revealed a high RR of 2.87 (1.50 to 5.58) for long-term smoking cessation (figure 3b).

Discussion

We found a significant effect of the perioperative smoking cessation programmes on short-term, while there was no clear overall effect on longer term. However, the intensive intervention programmes of 6-8weeks showed a significantly increased smoking cessation rate after one year (4;13;29;40). No studies followed up on the quit rate for more than one year, and they did not include long-term functionality and health, mortality or costs over time.

Studies of smoking intervention in other groups of hospital patients have recently been reviewed by dr. Rigotti and her colleagues (41). They found that only programmes lasting for one month or more after discharge were effective, thus sustaining our results. Nevertheless, these

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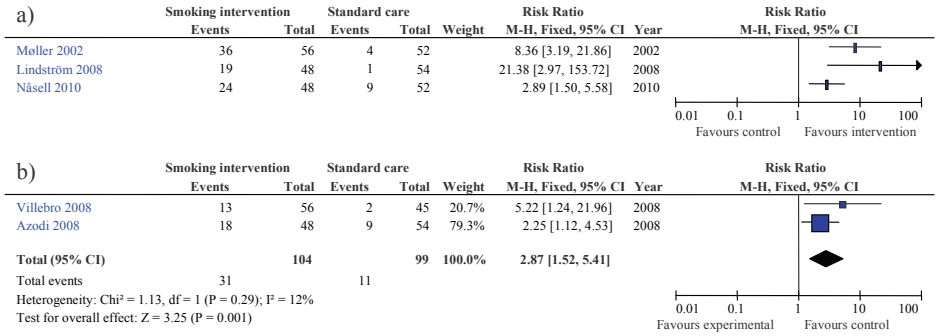
Figure 3 Sub-group analysis of the results of intensive smoking cessation programmes on quit rates in the perioperative period (a) and at follow-up after 12 months (b).



findings do not exclude that minimal smoking cessation programmes might be useful for some subgroups of hospitalised smokers or smokers in other settings. The intensive smoking intervention programmes also have a clear beneficial effect on the development of complications after surgery in smokers compared to the brief intervention programmes (14), and they seem most attractive for implementation in surgical settings.

However, the bias and limitations of our review should be kept in mind. Especially, the relatively small sample sizes of several of the included studies may be followed by a significant risk of type 2-failure, thereby overlooking minor effects. On the other hand, the use of point prevalence and self-reported quit rates without validation may overestimate an outcome (38;39). Furthermore, the patient groups differed regarding primary diagnosis and co-morbidity, smoking history and other factors influencing the effect of smoking cessation programmes. According to the consecutiveness of included patients the heterogeneity of the materials may be high. On the other hand the consecutiveness would improve the possibility of generalising and translation of the results. All studies were performed in high-income Western countries, and care should be taken if translated to other countries, cultures and patient groups.

From a clinical perspective, the intensive smoking cessation intervention programmes of 4-8 weeks of duration are preferable for surgical patients due to the immediate risk reduction of postoperative complications previously described as well as due to the beneficial long term effect on the quit rate. Implementation through evidence-based clinical guidelines and follow-up for effect could easily be established using the HPH Model for Documentation of Health Promotion activities (42) and a clinical quality registry such as the Danish national smoking cessation database (www.scdb.dk). These tools allow ongoing exchange of knowledge and experience as well as identification and updating of the most effective programmes for the benefit of the individual patient and the society as a whole.

The patients are positive, when it comes to smoking cessation programs in the perioperative period, especially the intensive programmes of 4-8 weeks duration are requested (4;40;43;44). This is in contrast to the fear of stigmatising smokers, when recommending smoking cessation before surgery, which was hypothesised previously (45;46).

From a scientific point of view, future studies should be powered to include follow-up after longer time, e.g. 3-5 years, for smoking habits as well as for long-term postoperative complications and functionality, mortality and costs.

In conclusion, this review supports that the briefer perioperative smoking cessation intervention programmes are effective on short-term only, while the intensive programmes of six to eight weeks duration are effective on long-term as well.

Competing interests: None declared.

Contributors

Conception and design: HT, TT
Acquisition of data: HT, TT
Analysis and interpretation of data: TT
Drafting the article: HT
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Approving the article: HT, TT

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