



Preoperative smoking cessation as part of surgical prehabilitation

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To the Editor,

There is a growing interest in multimodal prehabilitation programs prior to surgery. Several recent guidelines have recommended multimodal prehabilitation programs that include smoking cessation. While preoperative smoking cessation programs reduce perioperative complications and increase long-term abstinence,¹ the impact of smoking cessation interventions as part of multimodal prehabilitation programs has not been described. As such, we performed a systematic review to summarize the literature on prehabilitation programs that have included smoking cessation.

A literature search was performed in April 2018 of Medline, Medline In-Process, Embase, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PubMed-NOT-Medline, CINAHL, Web of Science, and Scopus. Studies that evaluated the effect of preoperative smoking cessation as part of surgical prehabilitation were included.

The literature search identified seven studies for inclusion (Table). Five studies were observational studies and two were randomized-controlled trials. The study

populations included patients undergoing elective thoracic, abdominal, and orthopedic surgeries. Interventions generally consisted of a combination of aerobic exercise, strength training, pulmonary rehabilitation, and lifestyle modification including smoking cessation.

Five studies assessed the effect of their interventions on postoperative outcomes. Three studies found an improvement in outcomes, primarily a reduction in postoperative pulmonary complications and hospital length of stay; however, two other studies failed to show a reduction in postoperative pulmonary complications.

Three studies examined the effect of the intervention on exercise capacity and health-related quality of life. The results show that the interventions can effectively improve exercise capacity; however, the results for quality of life were inconsistent.

Three studies reported the number of current smokers undergoing the intervention that quit smoking preoperatively, with abstinence rates from 46–100%. The results show that the interventions resulted in a high smoking abstinence rate prior to surgery; however, long-term abstinence was not measured in any of the studies.

Even though the evidence suggests some beneficial effects, the evidence for smoking cessation interventions in the context of multimodal prehabilitation programs is limited. Most of the studies were observational, and only two were randomized studies with small sample sizes. The studies were heterogeneous with regards to the surgical population, types of interventions, and outcomes. Most of the studies did not start the smoking cessation intervention early enough (at least four weeks before surgery—the minimum period shown to reduce postoperative complications).¹ Most importantly, as no study compared prehabilitation programs with and without smoking cessation, we are not able to identify the specific benefits

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Table Study characteristics

Author and year	Study design and sample size	Type of surgery	Smoking cessation intervention	Other interventions	Results	Smoking cessation rate
Bradley <i>et al.</i> 2013 ^A	Cohort 363	Lung resection surgery for cancer	Locally available smoking cessation pathways consisting of smoking cessation advice, counselling and nicotine replacement therapy Timeline not described	Hospital education session by lung cancer nurse specialist or physiotherapist One hour exercise training twice weekly consisting of endurance, strength and inspiratory muscle exercises Referral to dietician if patient has BMI < 20 kg·m ⁻² or weight loss > 10% in the last three months	No differences in PPCs between intervention and control groups (9 vs 16%, $P = 0.21$) or readmissions (5 vs 14%, $P = 0.12$)	46%
Vagvolgyi <i>et al.</i> 2017 ^B	Cohort 208	Thoracic surgery, mainly lung cancer	45 min smoking cessation program once weekly by psychologists Intervention length: three weeks	Pulmonary rehabilitation: 30 min respiratory training once per day and 10-30 min of endurance exercise 2-3 times per day	Improvement in FEV1, FVC, 6MWD, and grip strength ($P < 0.05$), and in HRQOL (mMRC and CAT) ($P < 0.001$)	76%
Bobbio <i>et al.</i> 2008 ^C	Cohort 12	Lung resection for cancer	Smoking cessation counselling Intervention length: four weeks	Pulmonary rehabilitation: optimization of bronchodilators, controlled breath/cough techniques, incentive spirometry exercises, aerobic training, and free weight exercises Intervention: 1.5 hr appointments five days/week	Improvement of 2.8 mL·kg ⁻¹ ·min ⁻¹ of VO ₂ max ($P < 0.001$)	Not reported
Stein and Cassara 1970 ^D	RCT 77	Surgeries of thorax or abdomen	Smoking cessation counselling Timeline not reported	Therapy: antibiotics when indicated, bronchodilator drugs, inhalation of humidified gases, segmental postural drainage and chest physiotherapy	Lower rate of PPCs (22% vs 60%, $P < 0.01$) and shorter LOS (12 vs 24 days, $P < 0.05$) in intervention group	Not reported
Hiramatsu <i>et al.</i> 2014 ^E	Case-control 240	Subtotal esophagectomy	Smoking cessation counselling Mean length: 11 days	Three breathing exercise procedures (deep breathing, use of breathing exercise device, respiratory muscle stretch gymnastics) 2 procedures of oral care (professional oral cleaning, clean mouth and teeth) Nutritional control	The care bundle: significant effectiveness for preventing postop pneumonia (OR = 0.16; 95% CI, 0.01 to 0.94, $P < 0.1$)	100%
Wheatley <i>et al.</i> 1977 ^F	RCT 30	Inguinal hernia repair	Smoking cessation counselling Intervention length: five days preoperatively	Intensive physiotherapy: daily breathing exercises, percussion and posturing	No difference in rate of PPCs between the three groups ($P > 0.05$)	Not reported

Table continued

Author and year	Study design and sample size	Type of surgery	Smoking cessation intervention	Other interventions	Results	Smoking cessation rate
Hansen <i>et al.</i> 2012 ^G	Cohort 132	Hip or knee arthroplasty	Motivational conversation and invitation to attend a smoking cessation seminar combined with Nicorette treatment Intervention length < four weeks	Preop motivational conversation with nurse to identify modifiable risk factors (smoking, nutrition, alcohol, exercise, general health and medication)	Less minor complications before discharge, complications within three months post-discharge, readmissions, and mortality were identified in intervention vs control patients (OR = 0.34; 95% CI, 0.13 to 0.84, <i>P</i> = 0.019) Median LOS: one day less in intervention patients (<i>P</i> < 0.001). No significant difference in HRQOL (EQ-5D and DSOS)	Not reported

BMI = body mass index; CAT = COPD Assessment Test; CI = confidence interval; DSOS = disease specific outcome score; FEV1 = forced expiratory volume in one second; FVC = forced vital capacity; EQ-5D = EuroQuol 5d questionnaire; HRQOL = health-related quality of life; LOS = length of stay; mMRC = Modified Medical Research Council Dyspnea Scale; OR = odds ratio; postop = postoperative; PPCs = postoperative pulmonary complications; preop = preoperative; RCT = randomized-controlled trial; VO₂ max = maximal oxygen uptake; 6MWD = six- minute walk distance

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of preoperative smoking cessation in the context of a multimodal prehabilitation program and to examine potential synergistic effects.

Only three studies described in detail the smoking cessation interventions (a combination of counselling with or without nicotine replacement therapy). For preoperative smoking cessation, effective interventions should include both counselling and pharmacological components. In addition to direct counselling, telephone quit-lines and patient e-learning programs providing both preoperative and postoperative support improve quit rates.^{2,3} For pharmacotherapy other than nicotine replacement, varenicline and bupropion have been shown to help patients quit smoking perioperatively.^{4,5} None of these additional interventions were utilized in the included

studies and should be considered in future multimodal prehabilitation trials. Additionally, the smoking cessation intervention should be started at least four weeks before surgery to reduce postoperative complications.¹

Whether smokers are more likely to quit and have better postoperative outcomes if they are participating in multimodal prehabilitation programs versus smoking cessation interventions alone should be explored in future studies. It is important to investigate the efficacy and appropriateness of different aspects of such programs.

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