

# **Rapid literature review: Economic evaluation of smoking cessation programs in the oncology setting**

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Against Cancer**

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## Table of Contents

ABSTRACT.....	4
INTRODUCTION.....	5
Rationale.....	5
Objective.....	6
METHODS.....	6
Protocol and registration.....	6
Eligibility criteria.....	6
Information sources and search strategy.....	7
Study selection.....	7
Data collection process.....	8
Data items.....	8
Quality appraisal.....	8
Synthesis of included studies.....	8
RESULTS.....	9
Slatore et al. (2009) <sup>28</sup> .....	9
Quality of evidence.....	10
DISCUSSION.....	10
Summary of evidence.....	10
Limitations.....	11
Conclusions.....	11
ACKNOWLEDGEMENTS.....	13
FUNDING.....	13
REFERENCES.....	14
FIGURE 1. FLOW DIAGRAM OF THE LITERATURE SEARCH.....	17

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LIST OF ACRONYMS.....	18
APPENDIX 1: POTENTIAL INTERVENTIONS.....	19
APPENDIX 2: SEARCH STRATEGIES.....	20
Search strategy for MEDLINE.....	20
Search strategy for EBM reviews: NHS.....	23
Search strategy for EBM reviews: Cochrane Database.....	26
APPENDIX 3: SCREENING DOCUMENTS.....	29
Level 1 screening for titles and abstracts.....	29
Level 2 screening for full-text articles.....	30
APPENDIX 4: QUALITY APPRAISAL CHECKLIST <sup>27</sup> .....	31
APPENDIX 5: DATA EXTRACTION TABLES.....	32
Study characteristics.....	32
Participant characteristics.....	33
Economic evaluation.....	34
APPENDIX 6: QUALITY APPRAISAL TABLE.....	36
APPENDIX 7: ADDITIONAL STUDY.....	37

## ABSTRACT

**Background:** Smoking is a well-known health risk, increasing the risk of developing over a dozen different cancers and a number of chronic diseases. Smoking cessation has been shown to improve health outcomes and survival; however, smoking cessation programs are rare in the oncology setting. While clinical benefits have been demonstrated, economic benefits have not been examined through a review of the literature. Understanding the cost-effectiveness of smoking cessation programs will provide useful information on the value of investment in this area.

**Objective:** Our objective was to conduct a rapid literature review of economic evaluations of smoking cessation programs for patients with cancer. This project represents the first step in building a better understanding of the potential economic benefits of smoking cessation programs in the oncology setting.

**Methods:** We conducted a rapid literature review of economic evaluations of smoking cessation programs in the oncology setting. Our search focused on Ovid MEDLINE (from 1946 to February 2015) and OVID EBM Reviews. The population of interest was adult (aged  $\geq 18$  years) cancer patients. The interventions of interest were any types of smoking cessation programs (nonpharmacological, pharmacological, or combinations of interventions). Comparators were usual care or no smoking cessation program. Our primary outcome of interest was the incremental cost-effectiveness ratio (ICER). In order to be included, the study had to be an economic evaluation.

**Results:** Our search identified 1,030 abstracts where only 1 full-text article met the inclusion criteria and was an economic evaluation of a smoking cessation program for cancer patients. Specifically, the study evaluated the cost-effectiveness of a formal smoking cessation program for patients with early stage non-small cell lung cancer.

**Conclusions:** This rapid literature review highlighted that there were very few published economic evaluations of smoking cessation in the oncology setting. The benefits of smoking cessation have been reported using different clinical outcomes; however, economic benefits have not been examined to a similar degree. Moving forward, in addition to the evaluation of the effectiveness of a smoking cessation program for cancer patients, (*'does it work'* question), understanding the program's value for money (*'is it cost-effective'* question) would be helpful as this information could provide evidence from an economic perspective to assist in the decision making process.

**Implication of key findings:** Based on the information from this review, a smoking cessation program could be cost-effective depending on the decision-maker's budget or willingness-to-pay for one more additional outcome (quality-adjusted life year, life year). The findings also suggest that cost-effectiveness may be context- and population-specific. Current and future smoking cessation programs should consider incorporating an economic evaluation to the program in order to assess the program's value for money.

## INTRODUCTION

### Rationale

Smoking is a well-known health risk, increasing the risk of developing over a dozen different cancers and a number of chronic diseases.<sup>1,2</sup> It is the leading cause of preventable death in Canada.<sup>3,4</sup> Smoking is a contributing factor in 30% of all cancer deaths<sup>5,6</sup> and is the major cause of lung cancer incidence and mortality.<sup>1,7</sup> Evidence demonstrates that cancer patients who continue smoking have poorer outcomes such as greater toxicity, decreased treatment efficacy, decreased survival, and an increased risk of disease recurrence or developing a second cancer.<sup>8,9</sup> Published research has shown that cancer patients who quit smoking are more responsive to treatments,<sup>11-17</sup> and have improved survival.<sup>17-19</sup> More positive treatment outcomes may result in fewer adverse events thereby reducing hospitalization and emergency room visits.

Smoking cessation has been shown to improve health outcomes and survival.<sup>8</sup> However, smoking cessation programs are rare in the oncology setting.<sup>8,9</sup> While clinical benefits have been demonstrated (i.e., there are reviews of effectiveness of smoking cessation programs in oncology and general settings<sup>9,20-22</sup>), economic benefits have not been examined through a literature review.

In Ontario, smoking cessation has not been routinely provided in Regional Cancer Programs (RCPs) and there are very few resources available in this setting to encourage cancer patients to stop smoking. Recognizing this, Cancer Care Ontario's (CCO) Provincial Leadership Council endorsed a pilot smoking cessation program in September 2012. To implement the program, a Smoking Cessation Champion was designated at each RCP to work closely with CCO. This program is consistent with recommendations from the US Surgeon General's Report (2014) and the statement of the American Association for Cancer Research (2013). These reports highlighted the potential health benefits to cancer patients of smoking cessation and the need for both improved provision of cessation programs to cancer patients and further study on the impact of smoking cessation programs in this specific setting, which may facilitate the development and implementation of this type of program.

The intent of CCO's smoking cessation program is to ensure that cancer patients achieve the best possible health outcomes from their cancer treatments. Having implemented a pilot project aimed at educating health providers about the benefits of smoking cessation and screening ambulatory cancer patients for their smoking history, CCO plans to evaluate its pilot project and explore the expansion of this program to cancer patient populations.

In addition, the Canadian Partnership Against Cancer (CPAC) has recently commenced work to support integration of evidence-based approaches to tobacco cessation within cancer control systems across Canada, and is closely monitoring CCO's approach to integrating cessation programming as a best practice in the country. At CPAC, evidence is currently being synthesized related to tobacco's impact on cancer patient outcomes, evidence-based approaches to cessation within cancer control settings, and an inventory of tobacco cessation programs in Canada is being assembled. Understanding the cost-

effectiveness of smoking cessation programs will provide useful information as value for money is a guiding principle of both CCO and CPAC's strategic plans.<sup>10</sup> This rapid literature review will assist in this endeavor.

The findings of the review will assist CPAC, CCO, and other cancer agencies in planning for the future implementation and expansion of evidence-based cessation programs in cancer settings. In addition, the review of literature on economic evaluations of smoking cessation programs in similar settings will further support CCO in the evaluation of its pilot program. This review will provide information on the value for money spent on smoking cessation programs.

## **Objective**

Our objective was to conduct a rapid literature review of economic evaluations of smoking cessation programs for patients with cancer. This project represents the first step in building a better understanding of the potential economic benefits of smoking cessation programs in the oncology setting.

## **METHODS**

We conducted a rapid literature review of economic evaluations of smoking cessation programs in the oncology setting using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Statement to guide the conduct and reporting of this review.<sup>23</sup>

### **Protocol and registration**

A protocol was developed within the project team using the PRISMA-P statement for protocols.<sup>24</sup>

### **Eligibility criteria**

Our population was adult (aged  $\geq 18$  years) cancer patients. We included studies with cancer patients (as a subset or an entire sample) regardless of cancer type. The interventions of interest were smoking cessation programs: nonpharmacological (e.g., counseling, online support, booklets), pharmacological (e.g., nicotine replacement therapy, other pharmacotherapy), or multicomponent/combinations of interventions (Appendix 1). Comparators could be usual care or no smoking cessation program. Our primary outcome of interest was the incremental cost-effectiveness ratio (ICER), e.g., incremental cost per quality-adjusted life year, incremental cost per life year gained, and incremental cost per person who stopped smoking. In order to be included, the study had to be an economic evaluation (i.e., cost-effectiveness analysis, cost-utility analysis, cost-benefit analysis, or cost-minimization analysis).<sup>27</sup> We had no limit on time period and considered only human studies with a comparison group.

**Table 1. Study inclusion and exclusion criteria**

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>• Cancer patients</li> <li>• Smoking cessation intervention</li> <li>• Had a control group</li> <li>• English language</li> </ul>	<ul style="list-style-type: none"> <li>• No comparison group</li> <li>• Did not report information on cost</li> <li>• Not a smoking cessation intervention</li> <li>• Not written in English</li> </ul>

## Information sources and search strategy

We conducted searches of the following electronic databases from inception onwards: Ovid MEDLINE (from 1946 to February 2015) and OVID EBM Reviews (i.e., NHS Economic Evaluation Database, ACP Journal Club, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Cochrane Methodology Register, and Health Technology Assessment). In addition, the electronic database search was supplemented by a manual search of the included articles' references to identify any articles that may not have been identified from the main search. We also conducted a forward citation search of the studies that cited the included articles through Scopus and through the PubMed related articles function.

An experienced information specialist developed and conducted the literature searches. The search strategy for the main electronic literature search (MEDLINE) was peer reviewed by another information specialist using the Peer Review of Electronic Search Strategies (PRESS) checklist.<sup>25</sup> The literature search strategies were developed using medical subject headings and keywords to be found in the article's title or abstract. The search results related to the disease (cancer) and the intervention area (smoking cessation) were filtered using a validated set of economics keywords/subject headings to identify economic evaluation studies, namely the NHS Economic Evaluation Database (NHS EED) economics search filter for Ovid MEDLINE (<http://www.crd.york.ac.uk/crdweb/searchstrategies.asp>), which was validated by Canadian Agency for Drugs and Technologies in Health (CADTH).<sup>26</sup> Please see Appendix 2 for the full search strategies.

## Study selection

There were two levels of screening: Level 1 screening to review citations based on titles and abstracts; and Level 2 screening for reviewing the potentially relevant full-text articles identified through Level 1 (Appendix 3). One reviewer (LM) conducted the screening independently using the eligibility questions and an elaboration document containing clarifications and definitions related to the screening criteria. The second reviewer (WI) screened the excluded abstracts to ensure that potential articles were not missed. Abstracts were excluded if they did not meet the inclusion criteria.

For each level of screening, a pilot screening of a random sample of 20 studies was conducted; and only after agreement was met did the remaining search begin. Discrepancies were resolved by discussion

among the reviewers and, if necessary, the involvement of a third reviewer. The end results for this process were articles from which data were extracted. If the article was a conference (poster) presentation, the first author of the article was contacted for a full-text article. The process of literature selection was reported using a flow diagram (Figure 1), as recommended by the PRISMA statement.<sup>23</sup>

## Data collection process

A draft data extraction form was developed and modified as necessary from comments received by the project team and CPAC. For all relevant articles, two reviewers independently extracted the data using the standardized data extraction form to ensure data accuracy. Discrepancies were resolved by discussion among the reviewers and, if necessary, the involvement of a third reviewer.

## Data items

The data abstracted were: *study characteristics* (i.e., year of publication, population, sample size, intervention setting, study design, intervention (and details), comparator (and details), and follow-up time); *participant characteristics* (i.e., cancer type, mean age, sex (% of males), employment, median number of cigarettes smoked (range), and other health outcomes); and *economic evaluation* (i.e., country, type of economic evaluation, perspective, time horizon, currency (and year), discount rates, incremental cost, incremental effect, cost-effectiveness estimate, and whether uncertainty and sensitivity analysis were reported).

## Quality appraisal

The quality of included economic evaluations was assessed for descriptive purposes to inform the quality of the study, using a 10-item checklist published by Drummond et al. in 2005.<sup>27</sup> This checklist was divided into 10 main categories: 1) research question, 2) description of comparator, 3) intervention effectiveness, 4) costs and effects, 5) measurements, 6) data sources, 7) time horizon, 8) incremental estimates, 9) uncertainty, and 10) presentation and discussion (see Appendix 4).

The summary of the methodological quality appraisal was reported for each included study in the form of a percentage of completed checklist items, excluding not applicable items. For example, Study A may have met the criteria for 6 out of the 10 items, but 2 items were not applicable to study A. Therefore, the methodological quality summary for Study A would be 75% (6/8). Two reviewers independently appraised each included article. Discrepancies in quality appraisal were resolved through discussion and, if necessary, the involvement of a third reviewer.

## Synthesis of included studies

Extracted data (i.e., study characteristics, participant characteristics, and economic evaluation) from included articles were presented in text along with data extraction tables (Appendix 5) and a quality appraisal table (Appendix 6). Limitations of the studies were also summarized.

## RESULTS

Our search found 1,030 abstracts, from which, only 1 published full-text article (by Slatore et al., 2009) met the inclusion criteria and was subsequently included.<sup>28</sup> One article (by Emmon et al., 2005) was considered but did not completely meet the inclusion criteria;<sup>29</sup> this article focused on childhood cancer survivors who were cancer-free at the time of the smoking cessation program. Due to its partial relevance to this topic, the study's data extraction table, quality appraisal, and overall summary were reported in Appendices 5-7. The abstracts of two poster presentations were also identified as being potentially relevant. However, the available information did not contain all of the relevant information required to determine eligibility; therefore, they were not included in this report.

### **Slatore et al. (2009)<sup>28</sup>**

Slatore et al. (2009) developed a decision analytic Markov model to evaluate the cost-effectiveness of a formal smoking cessation program initiated before surgical resection for patients with early-stage non-small cell lung cancer (NSCLC) in the United States.<sup>28</sup> The control group was patients who were not offered the program. The intervention group received the program including nicotine replacement therapy (NRT) in the form of nicotine patches for eight weeks along with two short and two long counseling sessions provided by qualified physician or other qualified healthcare professional. The follow-up times were at 1-year and 5-years post-surgery. The analysis was conducted from the perspective of the health care provider and was reported in US dollars. The model included the cost and effectiveness of the smoking cessation program, including cost and incidence of perioperative complications, postoperative mortality, and utility measured in quality-adjusted life year (QALY). The outcomes of interest were QALY and life years gained, adjusted by a discount rate of 3%, which accounted for costs and benefits occurring at different points in time.

The total cost of the program was estimated to be \$199.96 per patient. The effectiveness of the smoking cessation program was reported as the abstinence rate at the time of surgery and 3-month post-surgery. For the intervention group, the abstinence rate was 78% at time of surgery and 19% at 3-month post-surgery. For the usual care group, the abstinence rate was 65% and 12% at time of surgery and 3-month post-surgery, respectively. The perioperative complication rate was assumed to be the same at 23% for both recent quitters and current smokers based on the literature. Utility scores were reported at 0.64 for recent quitters and 0.49 for current smokers. In general, health utility scores could range from 0 (worst possible health or death) to 1 (best possible health). The utility score was used to represent the patients' quality of life. The utility score and life years were employed to create a QALY, which is a preference-based utility measure of health-related quality of life as perceived by the patient. QALYs incorporate both length of life and quality of life into a single measure, and are calculated by combining health-related quality of life measures with data on health state duration. The QALY is the gold standard measure of effectiveness recommended for cost-effectiveness analysis and represents a global measure.<sup>30,31</sup> Yearly mortality was 5.1% for recent quitters and was 17.6% (ranging from 10-55%) for current smokers.

At 1-year post-surgery, the incremental cost-effectiveness ratios (ICERs) were reported as \$16,415 per QALY gained and \$45,629 per life year gained. At 5-year post-surgery, the ICERs were \$2,609 per QALY gained and \$2,703 per life year gained. Cost-effectiveness estimates were most sensitive to the frequency of perioperative complications and the utility estimates. Sensitivity analyses were performed on a number of scenarios. For example, with the cost for the smoking cessation program being \$450, the ICERs were \$5,871 per QALY gained and \$6,083 per life year gained at 5-year post surgery.

In summary, this study reported that a formal smoking cessation program initiated before surgical resection for patients with early-stage NSCLC was more effective but also more costly than no intervention. The cost-effectiveness of this smoking cessation program became more evident as time increased, i.e., years after the program completed, the benefits of the program continued.

## Quality of evidence

Using a 10-item checklist published by Drummond et al. (2005),<sup>27</sup> the study by Slatore et al. (2009) scored 'yes' to 9 out of 10 items (90%).

## DISCUSSION

### Summary of evidence

From 1,030 abstracts, our rapid review search identified only 1 published article that met the inclusion criteria and was an economic evaluation of a smoking cessation program for patients with cancer.

Our findings could not be directly compared to other cost-effectiveness analysis of smoking cessation programs in this specific population due to the lack of studies and review on this topic; however, preliminary comparison could be made to the general population. In the general population, smoking cessation interventions (e.g., telephone counseling, nicotine replacement therapy and pharmacological-based therapies (e.g., varenicline and bupropion)) are considered to be effective and cost-effective.<sup>32,33</sup> These findings in the general population depended on the choice of comparator and decision-maker's budget.<sup>32,33</sup> Similar findings were found for our population in the oncology setting. For patients with early-stage NSCLC, counseling and nicotine replacement could be considered cost-effective, when compared to no intervention. If the decision-maker's willingness-to-pay for one QALY is more than \$12,000 US dollars from the perspective of health care system at 5-year post-surgery, the findings suggested that smoking cessation could be beneficial for those with operable lung cancer (i.e., which was largely earlier stage disease<sup>34,35</sup>) in terms of both decreased mortality and increased quality of life.<sup>28</sup>

Our project adds to the literature by reporting a review of the value for money of smoking cessation interventions specifically in the oncology setting. Compared to no intervention, smoking cessation will cost more but will also be more effective. It is noteworthy that the cost-effectiveness of smoking cessation programs becomes more evident over longer time intervals. Additionally, this project

highlighted the limited evidence and thus the need for more research on the cost-effectiveness analysis of smoking cessation specifically in the oncology setting. Other studies have noted the need for more economic evaluation research in cancer prevention.<sup>36</sup>

## Limitations

There were limitations in this review. Since this was a rapid literature review, additional electronic databases (e.g., EMBASE, EconLit, CINAHL) were not searched for potentially relevant material. Furthermore, unpublished literature could be more thoroughly examined through websites of cancer research groups (e.g., Canadian Cancer Society, Cancer Research Institute, treatobacco.net), trial registries (e.g., clinicaltrials.gov), and conference abstracts. In addition, Level 1 screening included a screening criteria/question on our outcome of interest (i.e., cost or ICER). Abstracts reporting costs or ICERs were considered in our screening. However, studies, which conducted cost-effectiveness analysis as a secondary objective, may not have included cost-effectiveness findings in their abstracts.<sup>37</sup> Our Level 1 screening, therefore, might have inadvertently missed some relevant studies. Nevertheless, when abstracts appeared unclear concerning the inclusion of a cost variable, they were included in Level 2 for full-text screening. Based on the scope of a rapid review, we focused on the main databases/sources, as well as limited our results to those reported in English and mentioned cost or ICER in the abstract. Future research could build on our review.

The included study also had limitations. The study by Slatore et al. (2009) was limited by the availability, quality, and generalizability of data. Due to the lack of information, the study did not evaluate stage-specific survival, the data on utility scores were based on lung cancer survivors, and the costs of treatment for recurrent or metastatic disease were not included.<sup>28</sup> The treatment for Stage I and Stage II NSCLC could be significant at approximately \$26,000 and \$29,000, respectively.<sup>38</sup> A smoking cessation program might be more cost-effective if the costs of treating recurrent or metastatic diseases were to be included (as the smoking cessation program could have benefit in preventing recurrences). On the other hand, if recent quitters were to live longer with recurrent or metastatic diseases, the cost-effectiveness of the smoking cessation would be overestimated. Furthermore, the results are not applicable to lung cancer patients with inoperable disease (which is usually later stage disease). In other words, the findings might be limited to operable NSCLC (which is largely earlier stage disease<sup>34,35</sup>). Only the outcomes were discounted at 3%, whereas costs were not which could be because of the short time horizon. The study failed to provide the characterization of uncertainty around the cost-effectiveness estimates and did not report the currency year, which could influence the total and incremental cost.<sup>28</sup> Additionally, the study only considered one perspective (the health care system), thus excluding the cost and benefit from the perspectives of the patients and family members.

## Conclusions

This rapid literature review highlighted that there is limited literature on the economic evaluation of smoking cessation in the oncology setting. The benefits of smoking cessation have been reported using different clinical outcomes,<sup>9,20-22</sup> however, economic benefits have not been examined to a similar

degree. Moving forward, in addition to the evaluation of the effectiveness of a smoking cessation program for cancer patients, (*'does it work'* question), understanding the program's value for money (*'is it cost-effective'* question) would be helpful as this information could provide evidence from an economic perspective to assist in the decision making process.

Based on the information from the included study, a smoking cessation program could be cost-effective depending on a decision-maker's budget or willingness-to-pay for one more additional outcome (QALY, life year). The findings also suggest that cost-effectiveness may be context- and population-specific. Current and future smoking cessation programs should consider incorporating an economic evaluation of the program in order to assess the program's value for money.

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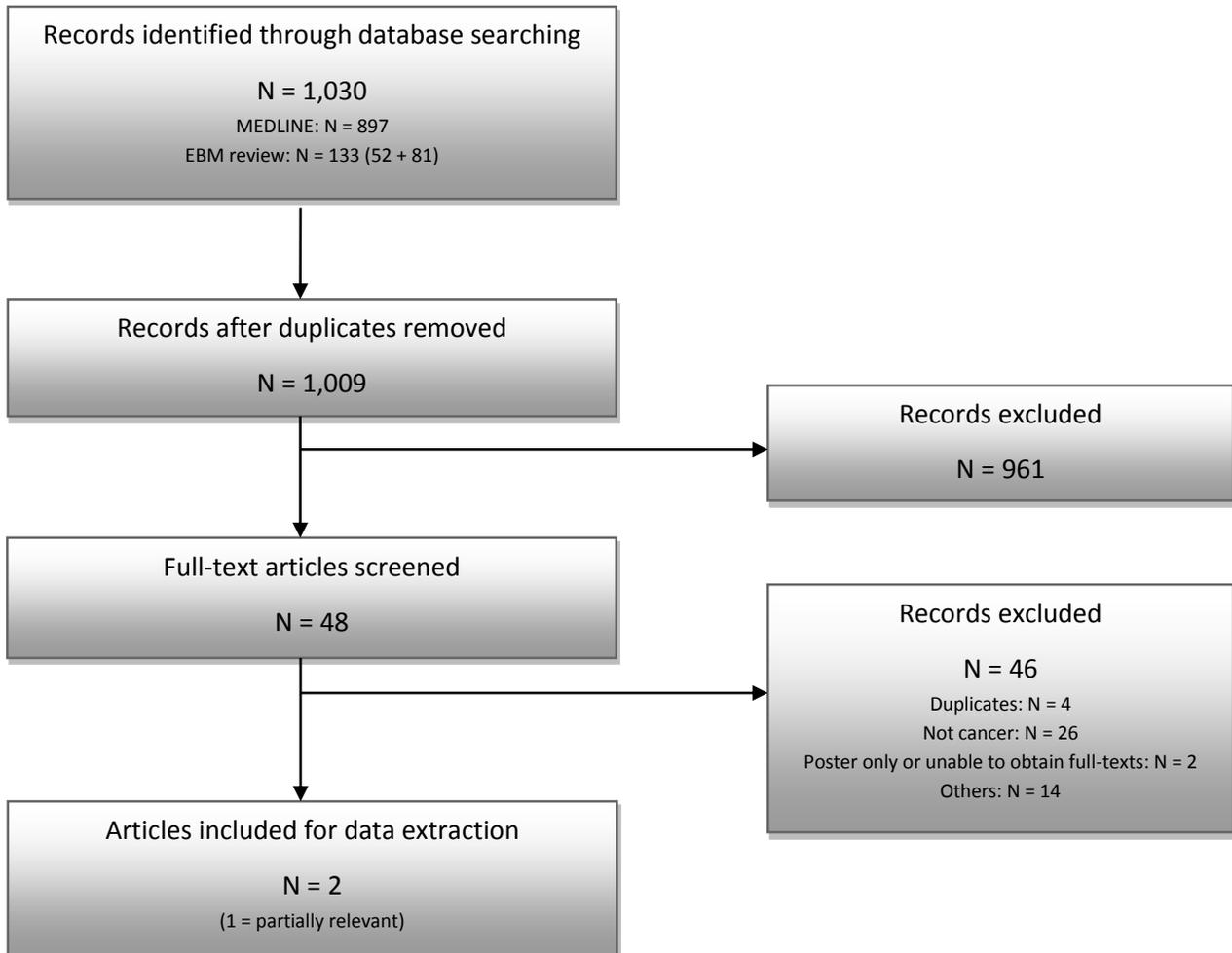
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**FIGURE 1. FLOW DIAGRAM OF THE LITERATURE SEARCH**



## LIST OF ACRONYMS

<b>Acronym</b>	<b>Full term</b>
<b>CADTH</b>	Canadian Agency for Drugs and Technologies in Health
<b>CCO</b>	Cancer Care Ontario
<b>CPAC</b>	Canadian Partnership Against Cancer
<b>ICER</b>	Incremental Cost-Effectiveness Ratio
<b>NHS EED</b>	NHS Economic Evaluation Database
<b>NRT</b>	Nicotine Replacement Therapy
<b>NSCLC</b>	Non-Small Cell Lung Cancer
<b>PRESS</b>	Peer Review of Electronic Search Strategies
<b>PRISMA</b>	Preferred Reporting Items for Systematic Reviews and Meta-analyses
<b>QALY</b>	Quality-Adjusted Life Year
<b>RCP</b>	Regional Cancer Program

## APPENDIX 1: POTENTIAL INTERVENTIONS

### Program Names

- Nicotine Anonymous
- Become an EX
- QuitNet
- Stay Away from Tobacco
- Break Free Alliance
- KAN-QUIT
- Stop Smoking Service
- Smoking Treatment for Ontario Patients
- Nicotine dependence clinic
- QuitNow
- FreshStart program
- Tobacco treatment center
- Quit Using and Inhaling Tobacco
- The Behaviour Change Roadmap
- Live Tobacco-Free
- Smokers' Helpline
- Quitnet
- Smoke-Free Living

### Medications

- Nicoderm
- NRT medication
- Nicotine Replacement Therapy
- Stop-Smoking Medications
- Champix Chantix (varenicline)
- Zyban (bupropion)
- Nicotine replacement products
- Nicotine patch gum, lozenge, inhaler, nasal spray

### Counseling

- Individual counsel
- Group counseling
- Telephone counseling
- Cognitive behavioural therapy
- Self-help
- Behavioral therapies (e.g., training in problem solving)
- Quitlines
- Online counseling
- Counseling and medication together

## APPENDIX 2: SEARCH STRATEGIES

### Search strategy for MEDLINE

Database: Ovid MEDLINE(R) <1946 to February Week 1 2015>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <February 05, 2015>

Search Strategy:

- 
- 1 exp "Tobacco Use Cessation"/
  - 2 "Tobacco Use Cessation Products"/
  - 3 Smoking/pc, dt, th [Prevention & Control, Drug Therapy, Therapy]
  - 4 "Tobacco Use Disorder"/dt, pc, rh, th [Prevention & Control, Drug Therapy, Rehabilitation, Therapy]
  - 5 (stop\* adj2 smok\*).tw.
  - 6 (quit\* adj2 smok\*).tw.
  - 7 (ceas\* adj2 smok\*).tw.
  - 8 (cessat\* adj2 smok\*).tw.
  - 9 (giv\* up adj2 smok\*).tw.
  - 10 (gave up adj2 smok\*).tw.
  - 11 (discontinue\* adj2 smok\*).tw.
  - 12 (smok\* adj2 quitline\*).tw.
  - 13 (smok\* adj2 helpline\*).tw.
  - 14 tobacco cessation.tw.
  - 15 nicotine cessation.tw.
  - 16 (smok\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 17 (tobacco addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 18 (tobacco depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 19 (Nicotine depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 20 (Nicotine addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 21 or/1-20
  - 22 Smoking/
  - 23 "Tobacco Use Disorder"/
  - 24 (smoke or smoker\* or smoking or anti-smok\* or antismok\* or tobacco or anti-tobacco or antitobacco or nictotine or anti-nicotine or antinicotine or cigarette\* or anti-cigarette\* or anticigarette\*).tw.
  - 25 22 or 23 or 24
  - 26 Smoking/px [Psychology]
  - 27 "Tobacco Use Disorder"/px [Psychology]
  - 28 exp Behavior Therapy/
  - 29 counseling/ or exp directive counseling/
  - 30 Health Promotion/
  - 31 Motivation/

- 32 Patient Education as Topic/  
 33 Self-Help Groups/  
 34 social support/  
 35 Avoidance Learning/  
 36 Reversal Learning/  
 37 "Conditioning (Psychology)"/  
 38 "Reinforcement (Psychology)"/  
 39 exp Mind-Body Therapies/  
 40 psychotherapy/ or hypnosis/ or "imagery (psychotherapy)"/ or psychotherapy, brief/  
 41 (behavio?r\* adj3 (chang\* or modif\* or therap\* or psychotherap\* or psycho-therap\* or  
 intervention\* or treatment\*)).tw.  
 42 (patient\* adj3 (educat\* or booklet\* or pamphlet\* or workshop\*)).tw.  
 43 (education\* adj3 (advice or class\$2 or intervention\* or program\* or project\* or train\*)).tw.  
 44 or/26-43  
 45 25 and 44  
 46 Bupropion/  
 47 Bupropion.tw.  
 48 zyban.tw.  
 49 (wellbutrin or zyantabac or quomen or amfebutamone or Budeprion or Buproban or Forfivo or  
 Budeprion or Aplenzin).tw.  
 50 (varenicline or champix or chantix or vareniclin).tw.  
 51 nicotine replacement.tw.  
 52 (nicotine adj2 (patch\* or gum or gums or lozenge\* or inhal\* or nasal or intranasal or spray\* or\* or  
 sublingual\* or tablet\* or transdermal\* or polacrilex)).tw.  
 53 NRT.tw.  
 54 (Nicotex or Nicorette or Nicoderm or Nicogum or Nicotinell or Habitrol).tw.  
 55 Nicotine Anonymous.tw.  
 56 Become an EX.tw.  
 57 QuitNet.tw.  
 58 Stay Away from Tobacco.tw.  
 59 Break Free Alliance.tw.  
 60 KAN-QUIT.tw.  
 61 Stop Smoking Service.tw.  
 62 Smoking Treatment for Ontario Patients.tw.  
 63 Nicotine depend?nce clinic.tw.  
 64 QuitNow.tw.  
 65 FreshStart program.tw.  
 66 Tobacco treatment cent\*1.tw.  
 67 "Quit Using and Inhaling Tobacco".tw.  
 68 The Behaviour Change Roadmap.tw.  
 69 Live Tobacco-Free.tw.  
 70 Smokers' Helpline.tw.  
 71 Quitnet.tw.  
 72 Smoke-Free Living.tw.  
 73 or/46-72  
 74 21 or 45 or 73  
 75 exp Neoplasms/

- 76 exp Oncology Nursing/ or exp Medical Oncology/ or exp Oncology Service, Hospital/ or Cancer Care Facilities/
- 77 (cancer\* or neoplasm\* or oncolog\* or tumor\* or tumour\* or malignan\* or neoplastic or metastas\* or metastatic or adenocarcinoma\* or sarcoma\* or carcinoma\* or lymphoma\* or melanoma or leukemia).tw.
- 78 or/75-77
- 79 74 and 78 (
- 80 Economics/
- 81 exp "costs and cost analysis"/
- 82 Economics, Dental/
- 83 exp economics, hospital/
- 84 Economics, Medical/
- 85 Economics, Nursing/
- 86 Economics, Pharmaceutical/
- 87 (economic\$ or cost or costs or costly or costing or price or prices or pricing or pharmaco-economic\$).ti,ab.
- 88 (expenditure\$ not energy).ti,ab.
- 89 value for money.ti,ab.
- 90 budget\$.ti,ab.
- 91 or/80-90
- 92 ((energy or oxygen) adj cost).ti,ab.
- 93 (metabolic adj cost).ti,ab.
- 94 ((energy or oxygen) adj expenditure).ti,ab.
- 95 or/92-94
- 96 91 not 95
- 97 letter.pt.
- 98 editorial.pt.
- 99 historical article.pt.
- 100 or/97-99
- 101 96 not 100
- 102 exp animals/ not humans/
- 103 101 not 102 [NHS EED MEDLINE Filter <http://www.crd.york.ac.uk/crdweb/searchstrategies.asp>]
- 104 79 and 103
- 105 limit 79 to "economics (maximizes sensitivity)"
- 106 limit 79 to "costs (maximizes sensitivity)"
- 107 104 or 105 or 106
- 108 remove duplicates from 107

## Search strategy for EBM reviews: NHS

Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2015>

Search Strategy:

- 
- 1 exp "Tobacco Use Cessation"/
  - 2 "Tobacco Use Cessation Products"/
  - 3 Smoking/pc, dt, th
  - 4 "Tobacco Use Disorder"/dt, pc, rh, th
  - 5 (stop\* adj2 smok\*).tw.
  - 6 (quit\* adj2 smok\*).tw.
  - 7 (ceas\* adj2 smok\*).tw.
  - 8 (cessat\* adj2 smok\*).tw.
  - 9 (giv\* up adj2 smok\*).tw.
  - 10 (gave up adj2 smok\*).tw.
  - 11 (discontinue\* adj2 smok\*).tw.
  - 12 (smok\* adj2 quitline\*).tw.
  - 13 (smok\* adj2 helpline\*).tw.
  - 14 tobacco cessation.tw.
  - 15 nicotine cessation.tw.
  - 16 (smok\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 17 (tobacco addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 18 (tobacco depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 19 (Nicotine depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 20 (Nicotine addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 21 or/1-20
  - 22 Smoking/
  - 23 "Tobacco Use Disorder"/
  - 24 (smoke or smoker\* or smoking or anti-smok\* or antimok\* or tobacco or anti-tobacco or antitobacco or nictotine or anti-nicotine or antinicotine or cigarette\* or anti-cigarette\* or anticigarette\*).tw.
  - 25 22 or 23 or 24
  - 26 Smoking/px [Psychology]
  - 27 "Tobacco Use Disorder"/px
  - 28 exp Behavior Therapy/
  - 29 counseling/ or exp directive counseling/
  - 30 Health Promotion/
  - 31 Motivation/
  - 32 Patient Education as Topic/
  - 33 Self-Help Groups/
  - 34 social support/

- 35 Avoidance Learning/  
 36 Reversal Learning/  
 37 "Conditioning (Psychology)"/  
 38 "Reinforcement (Psychology)"/  
 39 exp Mind-Body Therapies/  
 40 psychotherapy/ or hypnosis/ or "imagery (psychotherapy)"/ or psychotherapy, brief/  
 41 (behavior?r\* adj3 (chang\* or modif\* or therap\* or psychotherap\* or psycho-therap\* or  
 intervention\* or treatment\*)).tw.  
 42 (patient\* adj3 (educat\* or booklet\* or pamphlet\* or workshop\*)).tw.  
 43 (education\* adj3 (advice or class\$2 or intervention\* or program\* or project\* or train\*)).tw.  
 44 or/26-43  
 45 25 and 44  
 46 Bupropion/  
 47 Bupropion.tw.  
 48 zyban.tw.  
 49 (wellbutrin or zytobac or quomen or amfebutamone or Budeprion or Buproban or Forfivo or  
 Budeprion or Aplenin).tw.  
 50 (varenicline or champix or chantix or vareniclin).tw.  
 51 nicotine replacement.tw.  
 52 (nicotine adj2 (patch\* or gum or gums or lozenge\* or inhal\* or nasal or intranasal or spray\* or\* or  
 sublingual\* or tablet\* or transdermal\* or polacrilex)).tw.  
 53 NRT.tw.  
 54 (Nicotex or Nicorette or Nicoderm or Nicogum or Nicotinell or Habitrol).tw.  
 55 Nicotine Anonymous.tw.  
 56 Become an EX.tw.  
 57 QuitNet.tw.  
 58 Stay Away from Tobacco.tw.  
 59 Break Free Alliance.tw.  
 60 KAN-QUIT.tw.  
 61 Stop Smoking Service.tw.  
 62 Smoking Treatment for Ontario Patients.tw.  
 63 Nicotine depend?nce clinic.tw.  
 64 QuitNow.tw.  
 65 FreshStart program.tw.  
 66 Tobacco treatment cent\*1.tw.  
 67 "Quit Using and Inhaling Tobacco".tw.  
 68 The Behaviour Change Roadmap.tw.  
 69 Live Tobacco-Free.tw.  
 70 Smokers' Helpline.tw.  
 71 Quitnet.tw.  
 72 Smoke-Free Living.tw.  
 73 or/47-72  
 74 21 or 45 or 73  
 75 exp Neoplasms/  
 76 exp Oncology Nursing/ or exp Medical Oncology/ or exp Oncology Service, Hospital/ or Cancer Care  
 Facilities/

- 77 (cancer\* or neoplasm\* or oncolog\* or tumor\* or tumour\* or malignan\* or neoplastic or metastas\* or metastatic or adenocarcinoma\* or sarcoma\* or carcinoma\* or lymphoma\* or melanoma or leukemia).tw.
- 78 75 or 76 or 77
- 79 74 and 78

## Search strategy for EBM reviews: Cochrane Database

Database: EBM Reviews - [ACP Journal Club](#) <1991 to January 2015>, EBM Reviews - [Cochrane Central Register of Controlled Trials](#) <January 2015>, EBM Reviews - [Cochrane Database of Systematic Reviews](#) <2005 to December 2014>, EBM Reviews - [Database of Abstracts of Reviews of Effects](#) <4th Quarter 2014>, EBM Reviews - [Cochrane Methodology Register](#) <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <1st Quarter 2015>

### Search Strategy:

- 
- 1 exp "Tobacco Use Cessation"/
  - 2 "Tobacco Use Cessation Products"/
  - 3 Smoking/pc, dt, th
  - 4 "Tobacco Use Disorder"/dt, pc, rh, th
  - 5 (stop\* adj2 smok\*).tw.
  - 6 (quit\* adj2 smok\*).tw.
  - 7 (ceas\* adj2 smok\*).tw.
  - 8 (cessat\* adj2 smok\*).tw.
  - 9 (giv\* up adj2 smok\*).tw.
  - 10 (gave up adj2 smok\*).tw.
  - 11 (discontinue\* adj2 smok\*).tw.
  - 12 (smok\* adj2 quitline\*).tw.
  - 13 (smok\* adj2 helpline\*).tw.
  - 14 tobacco cessation.tw.
  - 15 nicotine cessation.tw.
  - 16 (smok\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 17 (tobacco addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 18 (tobacco depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 19 (Nicotine depend?n\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 20 (Nicotine addict\* adj3 (treatment\* or counsel\* or intervention\* or therapy or therapies or disease management or clinic or clinics or program\* or centre\*1 or center\*1)).tw.
  - 21 or/1-20
  - 22 Smoking/
  - 23 "Tobacco Use Disorder"/
  - 24 (smoke or smoker\* or smoking or anti-smok\* or antismok\* or tobacco or anti-tobacco or antitobacco or nictotine or anti-nicotine or antinicotine or cigarette\* or anti-cigarette\* or anticigarette\*).tw.
  - 25 22 or 23 or 24
  - 26 Smoking/px [Psychology]
  - 27 "Tobacco Use Disorder"/px
  - 28 exp Behavior Therapy/
  - 29 counseling/ or exp directive counseling/

- 30 Health Promotion/
- 31 Motivation/
- 32 Patient Education as Topic/
- 33 Self-Help Groups/
- 34 social support/
- 35 Avoidance Learning/
- 36 Reversal Learning/
- 37 "Conditioning (Psychology)"/
- 38 "Reinforcement (Psychology)"/
- 39 exp Mind-Body Therapies/
- 40 psychotherapy/ or hypnosis/ or "imagery (psychotherapy)"/ or psychotherapy, brief/
- 41 (behavio?r\* adj3 (chang\* or modif\* or therap\* or psychotherap\* or psycho-therap\* or  
intervention\* or treatment\*)).tw.
- 42 (patient\* adj3 (educat\* or booklet\* or pamphlet\* or workshop\*)).tw.
- 43 (education\* adj3 (advice or class\$2 or intervention\* or program\* or project\* or train\*)).tw.
- 44 or/26-43
- 45 25 and 44
- 46 Bupropion/
- 47 Bupropion.tw.
- 48 zyban.tw.
- 49 (wellbutrin or zyntabac or quomen or amfebutamone or Budeprion or Buproban or Forfivo or  
Budeprion or Aplenzin).tw.
- 50 (varenicline or champix or chantix or vareniclin).tw.
- 51 nicotine replacement.tw.
- 52 (nicotine adj2 (patch\* or gum or gums or lozenge\* or inhal\* or nasal or intranasal or spray\* or\* or  
sublingual\* or tablet\* or transdermal\* or polacrilex)).tw.
- 53 NRT.tw.
- 54 (Nicotex or Nicorette or Nicoderm or Nicogum or Nicotinell or Habitrol).tw.
- 55 Nicotine Anonymous.tw.
- 56 Become an EX.tw.
- 57 QuitNet.tw.
- 58 Stay Away from Tobacco.tw.
- 59 Break Free Alliance.tw.
- 60 KAN-QUIT.tw.
- 61 Stop Smoking Service.tw.
- 62 Smoking Treatment for Ontario Patients.tw.
- 63 Nicotine depend?nce clinic.tw.
- 64 QuitNow.tw.
- 65 FreshStart program.tw.
- 66 Tobacco treatment cent\*1.tw.
- 67 "Quit Using and Inhaling Tobacco".tw.
- 68 The Behaviour Change Roadmap.tw.
- 69 Live Tobacco-Free.tw.
- 70 Smokers' Helpline.tw.
- 71 Quitnet.tw.
- 72 Smoke-Free Living.tw.
- 73 or/47-72

- 74 21 or 45 or 73
- 75 exp Neoplasms/
- 76 exp Oncology Nursing/ or exp Medical Oncology/ or exp Oncology Service, Hospital/ or Cancer Care Facilities/
- 77 (cancer\* or neoplasm\* or oncolog\* or tumor\* or tumour\* or malignan\* or neoplastic or metastas\* or metastatic or adenocarcinoma\* or sarcoma\* or carcinoma\* or lymphoma\* or melanoma or leukemia).tw.
- 78 75 or 76 or 77
- 79 74 and 78
- 80 Economics/
- 81 exp "costs and cost analysis"/
- 82 Economics, Dental/
- 83 exp economics, hospital/
- 84 Economics, Medical/
- 85 Economics, Nursing/
- 86 Economics, Pharmaceutical/
- 87 (economic\$ or cost or costs or costly or costing or price or prices or pricing or pharmaco-economic\$).ti,ab.
- 88 (expenditure\$ not energy).ti,ab.
- 89 value for money.ti,ab.
- 90 budget\$.ti,ab.
- 91 or/80-90
- 92 ((energy or oxygen) adj cost).ti,ab.
- 93 (metabolic adj cost).ti,ab.
- 94 ((energy or oxygen) adj expenditure).ti,ab.
- 95 or/92-94
- 96 91 not 95
- 97 79 and 96
- 98 remove duplicates from 97

## APPENDIX 3: SCREENING DOCUMENTS

### Level 1 screening for titles and abstracts

1. **Did this study include adult (aged  $\geq 18$  years) cancer patients (as a subset or an entire sample)?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

Note: Any type of cancer

2. **Did the patients receive a smoking cessation intervention (either nonpharmacological or pharmacological types)?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

3. **Was the smoking cessation intervention being compared to usual care or other smoking cessation intervention? Was there a comparison group?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

Note: Any type of study design as long as it has a comparison group

4. **Was the abstract and article in English language?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

5. **Was the study a true economic evaluation (i.e., reporting an incremental cost-effectiveness ratio in a form of any outcomes such as QALY, life year)?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

6. **Did the study report any of the relevant costs (e.g., cost description or cost analysis)?**

YES \_\_\_\_\_

NO \_\_\_\_\_

UNCLEAR \_\_\_\_\_

## Level 2 screening for full-text articles

1. **Did this study include adult (aged  $\geq 18$  years) cancer patients (as a subset or an entire sample)?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

Note: Any type of cancer

2. **Did the patients receive a smoking cessation intervention (either nonpharmacological or pharmacological types)?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

3. **Was the smoking cessation intervention being compared to usual care or other smoking cessation intervention? Was there a comparison group?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

Note: Any type of study design as long as it has a comparison group

4. **Was the abstract and article in English language?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

5. **Was the study a true economic evaluation (i.e., reporting an incremental cost-effectiveness ratio in a form of any outcomes such as QALY, life year)?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

6. **Did the study report any of the relevant costs (e.g., cost description or cost analysis)?**

YES \_\_\_\_  
NO \_\_\_\_  
UNCLEAR \_\_\_\_

## APPENDIX 4: QUALITY APPRAISAL CHECKLIST<sup>27</sup>

Question	Response (Yes, No, N/A)
Q1. Was a well-defined question posed in answerable form?	
Q2. Was a comprehensive description of the competing alternatives given (i.e. can you tell who did what to whom, where, and how often)?	
Q3. Was the effectiveness of the programme or services established?	
Q4. Were all the important and relevant costs and consequences for each alternative identified?	
Q5. Were costs and consequences measured accurately in appropriate physical units (for example, hours of nursing time, number of physician visits, lost work-days, gained life-years)?	
Q6. Were costs and consequences valued credibly?	
Q7. Were costs and consequences adjusted for differential timing?	
Q8. Was an incremental analysis of costs and consequences of alternatives performed?	
Q9. Was allowance made for uncertainty in the estimates of costs and consequences?	
Q10. Did the presentation and discussion of study results include all issues of concern to users?	

Note. N/A = not applicable or not available

## APPENDIX 5: DATA EXTRACTION TABLES

This appendix reports three tables: 1) *study characteristics* (i.e., year of publication, population, sample size, intervention setting, study design, intervention (and details), comparator (and details), and follow-up time; 2) *participant characteristics* (i.e., cancer type, mean age, sex (% of males), employment, median number of cigarettes smoked (range), and other health outcomes); and 3) *economic evaluation* (i.e., country, type of economic evaluation, perspective, time horizon, currency (and year), discount rates, incremental cost, incremental effect, cost-effectiveness estimate, and whether uncertainty and sensitivity analysis were reported).

### Study characteristics

	<b>Slatore et al. (2009)</b>	<b>Emmons et al. (2005)*</b>
<b>Population</b>	Patients who smoke with non-small cell lung cancer at stage IIIB or less	Pediatric cancer survivors who smoke
<b>Sample size</b>	N/A	796 (TX = 386; UC = 398)
<b>Intervention setting</b>	N/A	Over the telephone
<b>Study design</b>	Markov model	Randomized controlled trial
<b>Intervention</b>	Counseling and nicotine replacement before surgical resection	Peer-based telephone counseling
<b>Intervention details</b>	Nicotine replacement (nicotine patches for eight weeks) along with two short and two long counseling sessions by qualified physician or other qualified healthcare professional	Each participant was assigned a peer counselor who worked with them throughout the intervention.  Up to six calls were provided over a 7-month period.
<b>Comparator</b>	No intervention	Self-help intervention
<b>Comparator details</b>	No counseling (but could obtain nicotine replacement independently)	Participants received a letter highlighting the importance of smoking cessation
<b>Follow-up time</b>	1-year and 5-years post-surgery	8- and 12-month follow-up

Note. N/A = not applicable or not available; TX = intervention group; UC = control group; \* denotes partially relevant.

## Participant characteristics

	<b>Slatore et al. (2009)</b>	<b>Emmons et al. (2005)*</b>
<b>Cancer type (N, %)</b>	Non-small cell lung cancer at stage IIB or less (100%)	Leukemia (26%) Hodgkin's disease (18%) CNS malignancy (12%) Non-Hodgkin's lymphoma (11%) Bone cancer (11%) Soft tissue sarcoma (9%) Kidney cancer (7%) Neuroblastoma (6%)
<b>Mean age (SD)</b>	N/A	31 (6.66)
<b>Sex (N, %)</b>	N/A	422 males (53%)
<b>Employed (N, %)</b>	N/A	637 (80%)
<b>Median number of cigarettes smoked (range)</b>	N/A	12 (1-100)
<b>Other health outcomes</b>	Perioperative complication rate: TX = 23% UC = 23%  Mortality rate: Recent quitters: 5.1% Current smokers: 17.6%  Utility score (from SF-36): Current smokers: 0.49 Recent quitters: 0.64	Past cancer treatment: Radiation, chemotherapy, or surgery only (92, 12%) Radiation and surgery (113, 14%) Radiation and chemotherapy (59, 7%) Chemotherapy and surgery (120, 15%) Radiation, chemotherapy, and surgery (259, 33%) Missing data (153, 19%)

Note. N = sample size; N/A = not applicable or not available; SD = standard deviation; TX = intervention group; UC = control group; \* denotes partially relevant.

## Economic evaluation

	<b>Slatore et al. (2009)</b>	<b>Emmons et al. (2005)*</b>
<b>Intervention</b>	Counseling and nicotine replacement before surgical resection	Peer-based telephone counseling
<b>Comparator</b>	No intervention	Self-help intervention
<b>Country</b>	USA	USA
<b>Type of economic evaluation</b>	Cost-utility analysis	Cost-effectiveness analysis
<b>Perspective</b>	Health care system	Intervention or program
<b>Time horizon</b>	1- and 5-year post-surgery	12 months
<b>Currency (year)</b>	USA (unknown)	USA (unknown)
<b>Discount rate</b>	3% for effect only	N/A
<b>Incremental cost</b>	Between \$1,600 to \$1,800	\$296.92
<b>Incremental effect</b>	1-year: Incremental QALY = 0.01 Incremental life year = 0.004  5-year: Incremental QALY = 0.09 Incremental life year = 0.08	Quit rate: TX = 15% UC = 9%
<b>Cost-effectiveness estimate</b>	1-year: \$16,415/QALY \$45,629/life year  5-year: \$2,609/QALY \$2,703/life year	\$5,371 per additional quit
<b>Uncertainty (yes/no)</b>	No	N/A
<b>Sensitivity analysis (yes/no)</b>	Yes	N/A

Note. N/A = not applicable or not available; TX = intervention group; UC = control group; \* denotes partially relevant.

## APPENDIX 6: QUALITY APPRAISAL TABLE

Question	Response (Yes, No, N/A)	
	Slatore et al. (2009)	Emmons et al. (2005)*
Q1. Was a well-defined question posed in answerable form?	Yes	Yes
Q2. Was a comprehensive description of the competing alternatives given (i.e. can you tell who did what to whom, where, and how often)?	Yes	Yes
Q3. Was the effectiveness of the programme or services established?	Yes	Yes
Q4. Were all the important and relevant costs and consequences for each alternative identified?	Yes	No
Q5. Were costs and consequences measured accurately in appropriate physical units (for example, hours of nursing time, number of physician visits, lost work-days, gained life-years)?	Yes	No
Q6. Were costs and consequences valued credibly?	Yes	Yes
Q7. Were costs and consequences adjusted for differential timing?	Yes	N/A
Q8. Was an incremental analysis of costs and consequences of alternatives performed?	Yes	Yes
Q9. Was allowance made for uncertainty in the estimates of costs and consequences?	No	No
Q10. Did the presentation and discussion of study results include all issues of concern to users?	Yes	Yes

Note. N/A = not applicable; \* denotes partially relevant.

## APPENDIX 7: ADDITIONAL STUDY

Emmons et al. (2005) conducted a randomized controlled trial to evaluate the impact of a peer-based telephone counseling intervention on smoking among childhood cancer survivors who were current smokers.<sup>29</sup> Participants (N = 796) were randomly assigned to either: 1) a peer-delivered telephone counseling intervention (intervention group, N = 386); or 2) a self-help intervention (control group, N = 398). The intervention was delivered over the telephone. Each participant in the intervention group was assigned a peer counselor who worked with the participant over a 7-month period; participants received up to six calls. For the control group, the participants received a letter highlighting the importance of smoking cessation. All participants were followed up at 8 and 12 months. The authors conducted a cost-effectiveness analysis from the program's perspective (only including program cost) using data from the trial and reported the findings in US dollars.

The top five types of cancer were leukemia (26%), Hodgkin's disease (18%), CNS malignancy (12%), non-Hodgkin's lymphoma (11%), and bone cancer (11%). Study participants had a mean age of 31 ( $\pm$  6.7), and 53% were males. Most of the participants were married/cohabiting (44%) or never married (41%). Approximately 40% of the participants had a post-high school diploma/degree. The median number of cigarettes smoked per day was 12 (ranging from 1 to 100). Most participants were either in the 'contemplator' stage or in the 'preparation' stage of readiness to quit smoking (43% and 39%, respectively).

The main outcome was the quit rate which was significantly higher in the intervention group compared with the control group at both 8 months (16.8% vs 8.5%.  $p < 0.01$ ) and 12 months (15% vs 9%,  $p \leq 0.01$ ). The cost of delivering the intervention was \$298.17 compared to the cost of the self-help intervention of \$1.25. At 12 months, the ICER was \$5,371 per additional quit. For the study by Emmons et al. (2005), the study scored 'yes' to 6/9 (67%).

This study had limitations mainly on the limited information on the cost-effectiveness analysis provided as they focused their primary analysis on the effectiveness. This study also did not report a sensitivity analysis and did not clearly define the costs and the effects (regarding what they included). The study failed to provide the characterization of uncertainty around the cost-effectiveness estimates and did not report the currency year, which could influence the total and incremental cost. Furthermore, the study only considered one perspective (the program), thus excluding the cost and benefit associated with the patients, family members, and health care system.

This study illustrated a substantial impact for a relatively low-intensity and low-cost intervention, that can be delivered via postal mail and telephone, without the need for in-person contact with the cancer population.