Does free nicotine replacement improve smoking cessation rates in cancer patients?

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ABSTRACT

Background Cigarette smoking is carcinogenic and has been linked to inferior treatment outcomes and complication rates in cancer patients. Here, we report the results of an 18-month pilot smoking cessation program that provided free nicotine replacement therapy (NRT).

Methods In January 2017, the smoking cessation program at our institution began offering free NRT for actively cigarette-smoking patients with cancer. The cost of 4 weeks of NRT was covered by the program, and follow-up was provided by smoking cessation champions.

Results From January 2017 to June 2018, 8095 patients with cancer were screened for cigarette use, of whom 1135 self-identified as current or recent smokers. Of those 1135 patients, 117 enrolled in the program and accepted a prescription for NRT. The rates of patient referral and patients attending a referral appointment were significantly higher in 2018–2018 than they had been in 2015–2016 (100% vs. 80.3%, p < 0.001, and 27.6% vs. 11.3%, p < 0.001, respectively). Median follow-up was 9.0 months (25%–75% interquartile range: 5.7–11.6 months). Of the patients who accepted NRT and who also had complete data (n = 71), 25 (35.2%) reported complete smoking cessation, and 32 (45.1%) reported only decreased cigarette smoking. On univariable analysis, no factors were significantly predictive of smoking cessation, although initial cigarette use (>10 vs. ≤10 initial cigarettes) was significantly predictive of smoking reduction (odds ratio: 5.04; 95% confidence interval: 1.46 to 17.45; p = 0.011).

Conclusions This pilot study of free NRT demonstrated rates of referral and acceptance of NRT that were improved compared with historical rates, and most referred patients either decreased their use of cigarettes or quit entirely.

Key Words Nicotine replacement therapy, smoking cessation

INTRODUCTION

Smoking cessation can be a difficult endeavor for patients and can require multiple attempts. However, smoking cessation confers numerous health benefits, including decreased risk of cancer and of all-cause mortality1. Even after a diagnosis of cancer, smoking cessation is associated with better oncologic outcomes and decreased treatment-related toxicities2–5.

Smoking cessation interventions can be divided into behavioural, pharmacologic, and system changes4–7. Behavioural interventions include individual counselling, support groups, and multimedia resources. The pharmacologic agents most commonly used to aid smoking cessation include nicotine replacement therapy (NRT), bupropion (a nicotinic receptor antagonist and atypical antidepressant), and varenicline (a nicotinic receptor partial agonist). Current guidelines and clinical trials suggest combining behavioural and pharmacologic strategies to achieve optimal quit rates5–7.

The diagnosis of cancer can provide an opportunity for patients to review their lifestyle and might allow them to be more receptive to smoking cessation counselling. We previously reported our institution’s modest success with a pilot smoking cessation program that focused on patient counselling and follow-up in addition to government-provided telephone counselling and Internet resources, but that required patients to pay for NRT8. This present study
examined enrolment data and smoking cessation outcomes for a subsequent iteration of our institution’s smoking cessation program in which we began offering free NRT to patients in addition to counselling.

METHODS

In 2014, a smoking cessation program was piloted at the London Regional Cancer Program; it began offering free NRT to actively smoking patients in January 2017. Newly registered patients at the centre were asked to complete a questionnaire about their smoking status. If patients indicated tobacco use in the preceding 6 months, they were asked about cigarettes smoked in the preceding 7 days, forms of tobacco used, amount smoked daily, number of minutes from waking to first smoke, importance of quitting (Likert scale: 1–5), and confidence in their ability to quit (Likert scale: 1–5). They were then counselled by an intake clerk about the benefits of smoking cessation and offered referral to the smoking cessation program.

A referral created an appointment with a smoking cessation champion, defined as a health care professional with additional training in smoking cessation counselling. The appointments were scheduled within 2 weeks of referral and could be completed by telephone or in person. Health care professionals were provided a process map that facilitated physician prescription of NRT for patients motivated to quit smoking. The cost of 4 weeks of NRT was covered by patient referral and patients attending a referral appointment were significantly more likely to pay for the 2-week course of NRT compared with those who did not attend a referral appointment. Patients with complete follow-up were significantly more likely to pay for a 2-week course of NRT than those without complete follow-up.

Institutional health research ethics approval was obtained to collect baseline patient characteristics and follow-up smoking-related data between January 2017 and June 2018. Two investigators contacted patients to determine cigarette use. Descriptive statistics were generated and compared using chi-square tests, Fisher exact tests, two-sample t-tests, or Wilcoxon rank sum tests, as appropriate. Univariable logistic regression was used to determine factors predictive of smoking cessation and reduction. All statistical analyses were performed in the SAS software application (version 9.4: SAS Institute, Cary, NC, U.S.A.) using 2-sided statistical testing at the 0.05 significance level.

RESULTS

Table 1 details patient enrolment data. From January 2017 to June 2018, 8095 cancer patients were screened for cigarette use, of whom 1135 (14.0%) self-identified as current or recent smokers. All were offered referral to the smoking cessation program, and 313 (27.6%) attended a referral appointment. Of those 313 patients, 117 (37.4%) accepted a prescription for NRT. Complete follow-up data were available for 71 patients (60.7%). Reasons for loss to follow-up included not providing consent at follow-up (15.2%), not being reachable (41.3%), and having died (43.5%).

Table ii presents the baseline characteristics of enrolled patients. Median age in the cohort was 60.7 years. Median number of cigarettes smoked per day was 15, and median years of smoking was 40. Most patients underwent curative-intent treatment (81.7%), with 73.9% being treated by a radiation oncologist. Median follow-up was 9.0 months [25%–75% interquartile range (iqr): 5.7–11.6 months]. The numbers of male and female patients were roughly equal. The most common primary disease sites were breast (14.1%), lung (32.4%), and head and neck (16.9%). Most patients were consistent in giving a high ranking to the importance of quitting (iqr: 5–5), but showed more variation in ranking their confidence in quitting (iqr: 2.5–4).

Table iii details smoking cessation outcomes. Of 57 patients (80.3%) who reported decreased cigarette smoking, 25 (35.2%) reported complete smoking cessation. The median decline in the number of cigarettes used was 58.3% (iqr: 16.7%–100%). On univariable analysis (Table iv), no factors were significantly predictive of smoking cessation, but reporting more than 10 initial cigarettes (compared with 10 or fewer) was significantly predictive of smoking reduction [odds ratio: 5.04; 95% confidence interval (ci): 1.46 to 17.45; p = 0.011]. Compared with the previous iteration of our smoking cessation program in 2013–2016, which required patients to pay for NRT, the 2017–2018 iteration found that rates of patient referral and patients attending a referral appointment were significantly higher (100% vs. 80.3%, p < 0.001, and 27.6% vs. 11.3%, p < 0.001, respectively).

DISCUSSION

Continued smoking has been associated with worse oncologic outcomes and treatment-related adverse events. A 2019 meta-analysis examined the effects of smoking on patients with head-and-neck cancer undergoing radiotherapy. The analysis spanned twenty-four studies comprising 6332 patients and found that continued smoking was associated with a higher risk of mortality (relative risk: 1.85; 95% ci: 1.55 to 2.21; p < 0.001) and of locoregional failure (relative risk: 2.24; 95% ci: 1.42 to 3.52; p < 0.001). Although the authors were unable to perform a quantitative analysis of toxicity data, a qualitative synthesis suggested that smoking was also associated with worse late treatment-related adverse events. Similar conclusions were reached in non-small-cell lung cancer, with a 2010 meta-analysis of...
five studies (860 patients with non-small-cell lung cancer) reporting that continued smoking was associated with increased risks for mortality (hazard ratio: 2.94; 95% CI: 1.15 to 7.54) and recurrence (hazard ratio: 1.86; 95% CI: 1.01 to 3.41)9.

We previously reported on enrolment data from our program in 2015–2016 at a time when we provided only counselling and follow-up results8. The present study suggests that, compared with a prior cohort of patients from our centre, the more recent cohort, who were provided with free NRT, showed higher rates of patient referral and smoking reduction. No identified factors were predictive for smoking cessation, and only a report of more than 10 initial cigarettes compared with 10 or fewer was significantly predictive of smoking reduction.

The cost of NRT varies depending on jurisdiction, formulation, and dose, with a 12-week course estimated to cost between $125 and $340 in Canada10. Cost-effectiveness analyses of NRT have been published, with one study reporting an incremental cost per life–year saved of $2,527 for a 45-year-old male smoker11. That incremental cost is relatively small compared with the drugs used in primary prevention of disease or in chemotherapy, which often carry an incremental cost per life–year saved well in excess of $10,00012.

Literature about the effectiveness of various smoking cessation interventions for the general public is abundant4–6. A 2011 meta-analysis examined the effectiveness of interventions in cancer patients specifically7. The pooled analysis of eight randomized controlled trials comprising 1304 patients showed no significant difference in cessation rates. However, it showed a trend toward higher rates of cessation in trials combining pharmacologic and behavioural interventions. Similar reviews have been performed for specific cancer types, although the availability of evidence is more limited9,13,14.

The results from a similar smoking cessation program at a cancer centre in Australia were published in 201615. That prospective single-cohort study provided combined pharmacologic and behavioural interventions to actively smoking patients with cancer. The authors described an abstinence rate of 24% (95% CI: 14% to 36%) in enrolled patients—a rate similar to that observed in the present study. Interestingly, the Australian authors also identified

| TABLE II | Baseline characteristics of enrolled patients |
|----------|---------------------------------------------|
| Characteristic | Value |
| Age (years) | Median 60.7 IQR 54.3–67.4 |
| Sex [n (%)] | Women 36 (50.7) Men 35 (49.3) |
| Follow-up (months) | Median 9 IQR 5.7–11.6 |
| NRT dose [n (%)] | 7 mg 14 (19.7) 14 mg 27 (38.0) 21 mg 23 (32.4) Multiple 7 (9.9) |
| Initial cigarettes smoked | Median 15 IQR 10–20 |
| Years smoked | Median 40 IQR 30–50 |
| Primary disease site [n (%)] | Breast 10 (14.1) Colorectal 7 (9.9) Gynecologic 6 (8.5) Head and neck 12 (16.9) Lung 23 (32.4) Other 13 (18.3) |
| Treatment intent [n (%)] | Curative 58 (81.7) Palliative 13 (18.3) |
| Specialty of primary oncologist [n (%)] | Radiation oncology 51 (73.9) Medical oncology 8 (11.6) Other 10 (14.5) |
| Wake-to-smoke interval (minutes) | Median 20 IQR 10–30 |
| Quit importance (1–5 Likert scale) | Median 5 IQR 5–5 |
| Patient quit confidence (1–5 Likert scale) | Median 3 IQR 2.5–4 |

TABLE III | Smoking cessation outcomes |
| Outcome | Value |
| Smoking status [n (%)] | Cessation 25 (35.2) Decrease 32 (45.3) No change 7 (9.9) Increase 7 (9.9) |
| Decrease in cigarettes (%) | Median 58.3 IQR 16.7–100 |

IQR = 25%–75% interquartile range; NRT = nicotine replacement therapy.
TABLE IV  Univariable logistic regression models predictive of smoking cessation and reduction

| Dependent variable | Comparator | Smoking cessation | Smoking reduction |
|--------------------|------------|-------------------|-------------------|
|                    |            | OR 95% CI p Value | OR 95% CI p Value |
| Age                | Per 5 years| 0.93 0.73 to 1.18 0.551 | 0.98 0.73 to 1.31 0.888 |
| Women              | Men        | 2.31 0.85 to 6.30 0.102 | 0.72 0.22 to 2.35 0.592 |
| NRT dose           | 14 mg 7 mg | 1.25 0.31 to 5.11 0.756 | 1.14 0.27 to 4.84 0.856 |
|                    | 21 mg 7 mg | 1.09 0.25 to 4.71 0.904 | 4.20 0.66 to 26.89 0.130 |
|                    | Multiple 7 mg 6.25 0.84 to 46.57 0.074 | 2.40 0.22 to 26.82 0.477 |
| Initial cigarettes | Per 10 units | 1.04 0.62 to 1.73 0.892 | 0.92 0.75 to 3.07 0.245 |
|                    | ≥10 ≤10 | 1.51 0.52 to 4.35 0.447 | 0.54 1.46 to 17.45 0.011 |
|                    | ≥20 ≤20 | 0.80 0.24 to 2.62 0.707 | 0.39 9.81 0.416 |
| Site of primary tumour | Breast Lung 0.87 0.19 to 3.92 0.853 | 0.719 |
|                    | Head and neck Lung 0.43 0.09 to 2.03 0.289 | 0.477 |
|                    | Other Lung 0.58 0.18 to 1.87 0.359 | 0.18 |
| Palliative | Curative 2.59 0.76 to 8.82 0.127 | 0.737 0.519 |
| Specialty of primary oncologist | Medical Radiation oncology 2.19 0.49 to 9.87 0.309 | 0.640 |
|                    | Other Radiation oncology 1.46 0.36 to 5.89 0.597 | 0.172 |
| Years smoked | Per 10 years 0.93 0.59 to 1.44 0.731 | 0.575 |
| Wake-to-smoke interval | Per 10 minutes 0.92 0.74 to 1.13 0.412 | 0.563 |
| Quit importance | Per 1 unit 0.90 0.40 to 2.06 0.809 | 0.367 0.580 |
| Patient quit confidence | Per 1 unit 1.28 0.84 to 1.96 0.245 | 0.472 0.583 |

*Sole significant value shown in boldface type.
OR = odds ratio; CI = confidence interval; C = concordance index; NRT = nicotine replacement therapy; NR = not reported.

2 factors associated with abstinence (readiness to quit and severe toxicity requiring hospitalization); in contrast, our study did not find any factors associated with cessation.

In our single-cohort study, no comparator was available to quantify the effectiveness of our smoking cessation interventions compared with standard clinical care. The generalizability of our conclusions is also limited, given that our work was conducted in a single institution. Because the median follow-up was 9 months, extrapolating conclusions about long-term cessation rates would be difficult. Further work could extend the follow-up time to examine long-term effects and could give consideration to other factors not captured in the present study.

CONCLUSIONS

This prospective single-cohort study of a smoking cessation program that piloted free NRT demonstrated rates of referral and acceptance of NRT that were improved compared with rates observed during the earlier program iteration. It also showed that most patients either decreased their cigarette use or quit entirely. Smoking cessation has been shown to be associated with benefits even after a diagnosis of cancer; it should be an important aspect of a patient’s cancer journey.

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CONFLICT OF INTEREST DISCLOSURES

We have read and understood Current Oncology’s policy on disclosing conflicts of interest, and we declare the following interests: AVL has received honoraria from Varian Medical Systems Inc. and AstraZeneca. All other authors have no conflicts of interest to disclose.

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