Research

Tobacco use disorder treatment in primary care
Implementing a clinical system pathway in Alberta

Diane Kunyk RN MN PhD Charl Els MBChB FCPsych MMedPsych DipABAM Sophia Papadakis MHA PhD Peter Selby MBBS CCFP FCFP DipABAM

Abstract

Objective To test a team-based, site-specific, multicomponent clinical system pathway designed for enhancing tobacco use disorder treatment by primary care physicians.

Design A prospective cohort study.

Setting Sixty primary care sites in Alberta.

Participants A convenience sample of 198 primary care physicians from the population of 2857.

Main outcome measures Data collection occurred between September 2010 and February 2012 on 3 distinct measures. Twenty-four weeks after the intervention, audits of the primary care practices assessed the adoption and sustainability of 10 tobacco clinical system pathway components, a survey measured changes in physicians’ treatment intentions, and patient chart reviews examined changes in physicians’ consistency with the treatment algorithm.

Results The completion rate by physicians was 89.4%. An intention-to-treat approach was undertaken for statistical analysis. Intervention uptake was demonstrated by positive changes at 4 weeks in how many of the 10 clinical system measures were performed (mean [SD] = 4.22 [1.60] vs 8.57 [1.46]; \( P < .001 \)). Physicians demonstrated significant favourable changes in 9 of the 12 measures of treatment intention (\( P < .05 \)). The 18,282 chart reviews documented significant increases in 6 of the 8 algorithm components.

Conclusion Our findings suggest that the provision of a tobacco clinical system pathway that incorporates other members of the health care team and builds on existing office infrastructures will support positive and sustainable changes in tobacco use disorder treatment by physicians in primary care. This study reaffirms the substantive and important role of supporting how treatment is delivered in physicians’ practices.

EDITOR'S KEY POINTS

- Primary care physicians are ideally placed to treat tobacco use disorders, but they are also challenged with increasing expectations to incorporate screening and treatment of other chronic diseases. It has been demonstrated that clinical system pathways promote organized and efficient patient care. This study aimed to test a team-based clinical system pathway to improve treatment of tobacco use disorder in primary care.

- Significant changes in the number of clinical system pathway measures were noted at 4 and 24 weeks, and performance of 6 of the 8 algorithmic treatments also increased significantly after the intervention (\( P < .05 \)). There were significant changes in 9 of the 12 treatment intentions (\( P < .05 \)); although no significant change was noted in the summative scores for treatment intention, this might be partly explained by the significant and desirable decrease in physicians’ agreement about autonomy in the decision to treat tobacco use disorders—a change that might reflect a new perception of shared responsibility across the health care team.

- Further follow-up 40 weeks after the intervention with the first 30 physicians who completed the study assessed sustainability. There was a significant increase in assessment of mood by the sustainability review compared with the postintervention review, and advising and assessing readiness to quit remained above preintervention levels. The sample size for the sustainability review was not adequate for evaluation of the other algorithm interventions.
Traitemet du tabagisme en contexte de première ligne
Instauration d'une méthode clinique en Alberta

Diane Kunyk RN MN PhD  Charl Els MBChB FCPsych MMedPsych DipABAM  Sophia Papadakis MHA PhD  Peter Selby MB BS CCFP FCFP DipABAM

Résumen
Objectif Faire l’essai d’un système clinique à composantes multiples reposant sur une équipe et propre au site, conçu pour améliorer le traitement du tabagisme par les médecins des soins primaires.

Type d’étude Étude de cohorte prospective.

Contexte Six centres de soins primaires en Alberta.

Participants Un échantillon de 198 médecins de première ligne sur un total de 2857.

Principaux paramètres à l’étude Entre septembre 2010 et février 2012, on a recueilli des données de trois paramètres distincts. Vingt-quatre semaines après l’intervention, des vérifications auprès des centres de soins primaires ont mesuré les taux d’adoption et de maintien de 10 composantes du système clinique visant l’arrêt du tabac; une enquête auprès des médecins a évalué les changements survenus dans leur intention de traiter; et un examen des dossiers des patients a vérifié les changements dans la constance des médecins à utiliser l’algorithme du traitement.

Résultats Le taux de réponse des médecins à l’enquête était de 89,4 %. Pour l’analyse statistique, on a choisi le principe de l’intention de traiter. Pour la mise en œuvre des interventions, on a utilisé les changements positifs observés après 4 semaines dans certains des 10 paramètres du système clinique (moyenne [ET] = 4,22 [1,60] vs 8,57 [1,46] : P < ,001). Des changements positifs significatifs ont été observés chez les médecins dans 9 des 12 paramètres de l’intention de traiter (P < ,05); même si on n’a pas noté de changement significatif dans le score global pour l’intention de traiter, cela pourrait s’expliquer par la diminution significative et souhaitable de l’opinion des médecins concernant leur droit de décider de traiter ou de ne pas traiter le tabagisme — un changement qui pourrait refléter une nouvelle perception du partage des responsabilités à l’intérieur de l’équipe des soins de santé.

La persistance des changements 40 semaines après l’intervention a été évaluée en utilisant les données des 30 premiers médecins qui avaient complété l’étude. On observait une augmentation significative de l’humeur telle qu’évaluée par l’évaluation de la persistance par rapport à l’évaluation post intervention, tandis que le fait de conseiller et d’évaluer l’intention de cesser de fumer demeurait supérieur au niveau pré-intervention. La taille de l’échantillon pour estimer la durabilité des changements n’était pas suffisante pour évaluer les autres interventions de l’algorithme.

Conclusion Nos résultats indiquent que la présence d’un système clinique visant l’arrêt du tabagisme qui fait appel à d’autres membres de l’équipe des soins de santé et qui s’appuie sur les infrastructures existantes de la clinique permettra d’obtenir des changements positifs durables dans le traitement du tabagisme par les médecins de première ligne. Cette étude réaffirme l’importance de s’assurer de la meilleure façon de prodiguer un traitement en pratique médicale.
Cigarettes have been described as the most deadly artifact in civilization’s history. Yet tobacco remains the only legal consumer product determined to be the cause of death for 1 out of 2 of its regular consumers. For patients smoking cigarettes, cessation is the most effective clinical intervention available for reducing morbidity and mortality. Given the health consequences, the effectiveness of evidence-based interventions, and the implications of a legal duty to treat, the inclusion of tobacco use disorder treatment as a standard of care is fundamental for primary care physicians. The Canadian and the US smoking cessation clinical practice guidelines support the 5 As approach of ask, advise, assess, assist, and arrange for tobacco treatment. Yet these are not consistently implemented. The Canadian Tobacco Use Monitoring Survey found that 56% of smokers who had seen physicians in the previous 12 months had received advice to quit. Other studies have documented that between 15% and 49% of patients are offered assistance with quitting, 3% to 8% are prescribed cessation medications, and 3% to 9% have follow-up contact arranged. These rates compare unfavourably with those for another chronic disease, hypertension, for which 80% of Canadians receive treatment. It has been demonstrated that clinical system pathways promote organized and efficient patient care. To improve tobacco intervention rates, it appears fundamental that the burden of care be shared across the primary health care team through a clinical system pathway based on evidence-based practice elements. Research suggests that key elements of tobacco clinical system pathways include patient identification and documentation; intervention prompting; resources for providers and patients; provider training and performance feedback; designation of a site lead; and identification of referral sources. Therefore, the purpose of this study was to test the hypothesis that integration of a team-based, site-specific, multicomponent tobacco clinical system pathway would result in increased treatment by primary care physicians.

**METHODS**

**Study design, sample, and setting**

A prospective cohort design was used to examine changes in physicians’ treatment intention and their tobacco interventions with patients in their primary care practices. The study aimed to recruit a convenience sample of 150 participants from the population of 2857 primary care physicians in the province of Alberta. Notices in their provincial newsletter and booths at conferences informed physicians that they could apply to receive 15 Mainpro-C continuing medical education credits upon project completion. The opportunity to join the project was offered to other participating physicians practising at the same primary care sites. Before study implementation, a pilot was undertaken in June 2010 with 8 physicians to test the feasibility and legitimacy of the intervention, the readability and comprehensiveness of the study materials, and the data collection instruments and procedures. The Community Research Ethics Board of Alberta approved the study protocol, and the Research Ethics Review Committee of the College of Physicians and Surgeons of Alberta determined it to be a quality assurance study.

**Intervention**

The focus of the intervention included physicians and other health care providers in their primary care practices. The intervention included 1) provision of a tobacco treatment algorithm; 2) identification of a tobacco lead at each site; 3) development of a site-specific system for prompting and recording; 4) resources for providers and patients; and 5) provider capacity-building activities. The treatment algorithm (Figure 1) is based on the 5 As intervention and recommends the ask be performed on patients starting at age 12 at each visit to capture tobacco experimentation, use, and relapses. It addresses tobacco, as opposed to smoking, to capture smokeless tobacco use and includes assess and assist for mood to capture the neuropsychiatric considerations associated with smoking and cessation. Management of positive screening results for mood disorders follows existing physician protocols. In collaboration with the tobacco lead, the study’s project team (centrally located) developed a visual diagram of physician and other health care team members’ algorithmic roles and responsibilities. This diagram facilitated communication of the tobacco clinical system pathway to participating physicians, nonparticipating physicians, and other health care providers at each site. Also in collaboration with the tobacco lead, the project team built upon practice-specific existing charting systems and office procedures to ensure that there were mechanisms to prompt each algorithmic intervention and its documentation. When existing electronic systems did not have this capacity, and for sites with paper charts, tools prepared by the project team included a waiting room screen, a desktop reminder, and a list of referral sources. Capacity-building activities included continuing education sessions, an educational video, consultation with an addiction psychiatrist, and written feedback from the chart reviews to individual physicians on their performance.
Measures
Following the pilot study in June 2010, data collection occurred between September 2010 and February 2012 on 3 distinct measures.

Tobacco clinical system pathway audit. Adapted from Critical Functions Analysis,22 the US Department of Health and Human Services systems strategies,18 and the Ottawa Model for Smoking Cessation,23 this audit measured the presence or absence of 10 indicators. Registered nurse members of the project team, in collaboration with the tobacco lead on site, conducted the measurement on site before the intervention, 4 weeks after the intervention to determine uptake, and again 24 weeks after the intervention to determine sustainability.

Physicians’ treatment intention scale. Surveys before the intervention and 24 weeks after the intervention asked physicians to rate their level of agreement with 12 treatment intention statements about their attitudes about, subjective norms of, and perceived behavioural control of tobacco treatment.24 Research based on the Theory of Planned Behaviour has determined that these 3 constructs predict treatment intention with physicians.25-27 The statements were developed based on established standards, with measurement on a 5-point scale (1 being strongly disagree and 5 being strongly agree).24

Patient chart review. Fifty patient charts per physician were examined before and 24 weeks after the intervention for indicators of the 8 possible algorithmic maneuvers. Another 50 charts each for the first 30 physicians completing the project were reviewed 40 weeks later to examine sustainability. On randomly generated review dates, a registered nurse from the project team reviewed the first 50 consecutive charts per physician of patients aged 12 years and older. Charts with documentation indicating that patients currently smoked, occasionally smoked, or had quit smoking were further reviewed for indicators of the other 7 algorithmic maneuvers.

Power calculation and sample size
The magnitude of the effect of the independent variable (tobacco clinical system pathway) on the dependent variables (physicians’ treatment intention and performance) was anticipated to be small: effect size of 0.2 as defined by Cohen.28 Given this parameter, with power set at 0.80 and the significance level set at .05, the minimum sample size required was calculated to be 80 physicians.

Statistical analysis
Measurements of central tendency and variability were calculated for each variable. Changes in tobacco clinical system pathway indicators, physicians’ treatment intentions, and patient chart reviews were determined by examining differences in the average preintervention and postintervention measures. The intention-to-treat analysis of data included physicians who did not complete the study as having not demonstrated improvement in system audits, treatment intention, or patient chart review indicators.
RESULTS

There were 198 Alberta primary care physicians with practices in 60 primary care sites that self-selected to participate; this exceeded the project recruitment goal by 37.5%. Twenty-one physicians completed the initial data collection but not the project intervention for a completion rate of 89.4%. There was equal representation from rural (50.2%) and urban (49.8%) practices. The study physicians’ practices were in primary care sites that ranged in size from 1 to 23 physicians (mean [SD] = 7 [2.87]). Not every physician at each primary care site participated in the study.

Tobacco clinical system pathway audit

The differences between the 10 indicators are displayed in Table 1 and Figure 2. Application of t tests for paired samples noted significant changes in composite scores at the 24-week postintervention assessment (mean [SD]=9.19 [1.22]) compared with the preintervention assessment (mean [SD]=4.22 [1.60]; t_{57}=-26.52; P<.001); at 4 weeks (mean [SD]=8.57 [1.46]) compared with preintervention assessment (t_{57}=-20.60, P<.001); and at 24 weeks postintervention compared with the 4-week assessment (t_{53}=-4.13, P<.001).

Physician treatment intention scale

The differences in the percentage of agree and strongly agree responses and the mean (SD) Likert-scale scores before and after the intervention are displayed in Table 2. There were significant changes in 9 of the 12 treatment intentions, including a favourable decrease in the proportion of physicians who agreed or strongly agreed with the following statement: “Whether or not I treat my patients who use tobacco is entirely up to me.” A reliability test of the 12 attributes in this scale determined a coefficient α=.75 on the preintervention and α=.66 on the postintervention surveys. The summative scores (n=169) ranged from 13 to 47 (mean [SD]=24.71 [5.75]) for the preintervention survey and from 12 to 46 (mean [SD]=24.31 [4.14]) for the postintervention survey. A paired-sample t test of the scale revealed no significant change in the physicians’ treatment intention scale.

Patient chart reviews

In this project, 18,828 patient chart reviews were completed: 9028 preintervention, 8090 postintervention, and 1710 at 40 weeks after the intervention to assess sustainability. Overall, of patients aged 12 years and older, 75.1% were asked about their tobacco use. Among these, 14.5% (2722) were currently using tobacco, 0.9% (173) occasionally used tobacco, and 1.5% (274) had quit within the past year. The proportion of charts with documentation of patients being asked about tobacco status rose from 67.6% in the initial review to 81.9% after the intervention, and 82.1% in the sustainability audits. The proportion of charts with unknown smoking status decreased from 18.5% (1718) before the intervention to 6.4% (537) after the intervention. The proportion of reviews for other algorithmic activities by the tobacco status of patients can be found in Table 3. Significant differences (P<.05) in 6 of the 8 algorithmic treatments were observed after the intervention (Figure 3). The exceptions were assisting with cessation medications and assisting with mood. The changes in algorithmic

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>PREINTERVENTION ASSESSMENT, %</th>
<th>4-WEEK ASSESSMENT, %</th>
<th>24-WEEK ASSESSMENT, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designated tobacco lead on site</td>
<td>32.2</td>
<td>98.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Health care team members other than physicians are incorporated in algorithmic activities</td>
<td>66.1</td>
<td>90.7</td>
<td>91.4</td>
</tr>
<tr>
<td>Screening method implemented to identify tobacco use</td>
<td>79.7</td>
<td>98.1</td>
<td>98.3</td>
</tr>
<tr>
<td>Screening instruments available to assess mood</td>
<td>15.3</td>
<td>88.9</td>
<td>91.4</td>
</tr>
<tr>
<td>Prompting to advise and assess</td>
<td>23.7</td>
<td>87.0</td>
<td>94.8</td>
</tr>
<tr>
<td>System to prescribe cessation medications</td>
<td>59.3</td>
<td>90.7</td>
<td>94.8</td>
</tr>
<tr>
<td>List of services and referral options</td>
<td>40.7</td>
<td>87.0</td>
<td>93.1</td>
</tr>
<tr>
<td>Ongoing recording of tobacco interventions on chart</td>
<td>61.0</td>
<td>85.2</td>
<td>93.1</td>
</tr>
<tr>
<td>Feedback given to practitioners on adherence to practice standards</td>
<td>37.3</td>
<td>88.9</td>
<td>96.6</td>
</tr>
<tr>
<td>Participation in regular meetings to discuss treatment issues</td>
<td>5.1</td>
<td>46.3</td>
<td>65.5</td>
</tr>
</tbody>
</table>
interventions between the postintervention and sustainability reviews are displayed in Figure 4. There was a significant increase in assessment of mood by the sustainability review compared with the postintervention review, but not for advising or assessing readiness; however, these remained above the preintervention rates. The sample size for the sustainability review was not adequate for evaluation of the assist and arrange interventions.

**DISCUSSION**

In this paper we report the results of an integrated, team-based, site-specific, multicomponent clinical system pathway for the delivery of tobacco use disorder treatment by primary care physicians. Through the support of the study project team, this pathway was built upon existing site-specific experiences, office procedures, charting systems, and supports. Despite the variable levels of system components observed at the beginning of the project, it appears reasonable to conclude that the intervention was implemented and sustained, as there were significant changes noted between each of the measurement points.

With this intervention, the burden of treatment was not solely focused on physicians but shared across members of the primary health care team. In smaller locations, the intervention was often limited to the physician and office support staff, and larger locations included multidisciplinary professionals (ie, registered nurses, nurse practitioners, or pharmacists). Regardless of the setting, there were high rates of participation and sustained intervention, which is likely explained by the substantial offering of continuing medical education credits to physicians who completed the project.

Physicians entered this study with optimistic intentions to treat tobacco use disorders in their practices. Through the process of participating in this project, favourable significant changes were noted in 9 of the 12 intention-to-treat attributes. An outlier in direction, the significant decrease in physicians’ agreement about autonomy in the decision to treat tobacco use disorders might be reflective of sharing its responsibility across the health care team. Given the observed changes in the adoption of the pathway and the audited improvement of 6 of the 8 recommended pathway maneuvers, it would appear reasonable to conclude that physicians’ treatment intentions did improve.

There was robust evidence from patient chart reviews indicating specific changes physicians made in their tobacco treatment. A significant increase was observed in asking, and this was maintained, with the end of the project’s screening rate for tobacco at 81.9%. This measure was whether patients aged 12 years and older were asked at every physician visit to capture uptake and relapses—a high level of rigour when compared with asking only new patients or at annual examinations. There was a significant increase for one of the assist interventions (the psychosocial component) but not for assisting with cessation medications. It is possible that the ease of prescribing cessation medications might have facilitated this intervention before the advent of this study, as the prestudy level of 22.9% implies when compared with the prestudy rate of 12.3% for psychosocial interventions. There might also have been some reluctance to prescribe, as Health Canada had required that the manufacturers of cessation medications include a boxed warning during the time of this study. Another possible explanation could be that, unlike many cessation studies, resourcing for this study did not include pharmaceutical industry funding. The patient chart review findings demonstrate that assessment of mood was integrated, but this did not
Table 2. Significance of paired-sample, 2-tailed t test comparison of physicians’ treatment intention statements before and at 24 weeks after the intervention: Statements were assessed on a Likert scale from 1 (strongly disagree) to 5 (strongly agree); mean (SD) scores are presented, along with the proportion of physicians who indicated that they agreed or strongly agreed; P values refer to the significance of the change in percentage.

<table>
<thead>
<tr>
<th>Statements</th>
<th>PREINTERVENTION SURVEY (N = 185)*</th>
<th>AGREE OR STRONGLY AGREE, %</th>
<th>MEAN (SD) SCORE</th>
<th>POSTINTERVENTION SURVEY (N = 169)*</th>
<th>AGREE OR STRONGLY AGREE, %</th>
<th>MEAN (SD) SCORE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Physician advice motivates patients to quit smoking</td>
<td>86.5</td>
<td>1.68 (0.788)</td>
<td>94.7</td>
<td>1.62 (0.698)</td>
<td>.311</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tobacco treatments are very effective</td>
<td>59.5</td>
<td>2.46 (1.06)</td>
<td>71.6</td>
<td>2.18 (0.960)</td>
<td>.014†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I believe that successful disease management is engaging patients in treatment</td>
<td>89.7</td>
<td>1.46 (0.841)</td>
<td>95.9</td>
<td>1.31 (0.655)</td>
<td>.044†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I am confident that I can discuss tobacco dependence treatment options with my patients</td>
<td>87.6</td>
<td>1.65 (0.835)</td>
<td>97.6</td>
<td>1.29 (0.602)</td>
<td>&lt;.001†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• In my practice, my patients do want me to ask about their use of tobacco products</td>
<td>73.0</td>
<td>2.01 (0.903)</td>
<td>83.4</td>
<td>1.78 (0.885)</td>
<td>.008†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The treatment of tobacco use and dependence should be considered a standard of practice for primary care physicians</td>
<td>91.4</td>
<td>1.50 (0.774)</td>
<td>94.7</td>
<td>1.33 (0.746)</td>
<td>.020†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• It is expected of me that I treat tobacco use and dependence in my patients</td>
<td>81.1</td>
<td>1.89 (0.887)</td>
<td>85.2</td>
<td>1.75 (0.900)</td>
<td>.087</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I am confident that I can monitor my patients’ mood while managing their tobacco use and dependence</td>
<td>49.7</td>
<td>2.48 (0.939)</td>
<td>88.2</td>
<td>1.80 (0.828)</td>
<td>&lt;.001†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Whether or not I treat my patients who use tobacco is entirely up to me</td>
<td>27.0</td>
<td>3.28 (1.21)</td>
<td>13.6</td>
<td>3.74 (1.16)</td>
<td>&lt;.001†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• People who are important to me think that patients do not have more important problems to address than their tobacco use</td>
<td>63.8</td>
<td>2.24 (0.913)</td>
<td>74.6</td>
<td>2.00 (0.926)</td>
<td>.016†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I intend to refer my patients who use tobacco for further counseling</td>
<td>61.6</td>
<td>2.28 (0.02)</td>
<td>69.2</td>
<td>2.11 (0.913)</td>
<td>.075</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The clinic where I work supports me to treat tobacco use and dependence</td>
<td>80.0</td>
<td>1.77 (0.910)</td>
<td>91.7</td>
<td>1.41 (0.752)</td>
<td>&lt;.001†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>70.9</td>
<td>24.71 (5.75)</td>
<td>80.0</td>
<td>24.31 (4.14)</td>
<td>.557</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Not all participating physicians completed the surveys.
†Significant at P < .05.
Table 3. Chart reviews by patient tobacco use status

<table>
<thead>
<tr>
<th>SMOKING STATUS</th>
<th>ADVISE, N (%)</th>
<th>ASSESS MOOD, N (%)</th>
<th>ASSESS READINESS, N (%)</th>
<th>ASSIST (PSYCHOSOCIAL), N (%)</th>
<th>ASSIST (MEDICATIONS), N (%)</th>
<th>ASSIST (MOOD), N (%)</th>
<th>ARRANGE FOLLOW-UP, N (%)</th>
<th>CHARTS, N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current smoker</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preimplementation review</td>
<td>697 (51.5)</td>
<td>379 (28.0)</td>
<td>580 (42.9)</td>
<td>166 (12.3)</td>
<td>310 (22.9)</td>
<td>213 (15.7)</td>
<td>231 (17.1)</td>
<td>1353</td>
</tr>
<tr>
<td>24-week review</td>
<td>836 (72.2)</td>
<td>727 (62.8)</td>
<td>879 (75.9)</td>
<td>484 (41.8)</td>
<td>377 (32.6)</td>
<td>244 (21.1)</td>
<td>559 (21.1)</td>
<td>1158</td>
</tr>
<tr>
<td>40-week review</td>
<td>144 (68.2)</td>
<td>104 (49.3)</td>
<td>160 (75.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>211</td>
</tr>
<tr>
<td><strong>Occasional smoker</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preimplementation review</td>
<td>32 (34.8)</td>
<td>8 (8.7)</td>
<td>15 (16.3)</td>
<td>2 (2.2)</td>
<td>3 (3.3)</td>
<td>7 (7.6)</td>
<td>8 (8.7)</td>
<td>92</td>
</tr>
<tr>
<td>24-week review</td>
<td>26 (41.3)</td>
<td>29 (46.0)</td>
<td>34 (54.0)</td>
<td>6 (9.5)</td>
<td>5 (7.9)</td>
<td>5 (7.9)</td>
<td>20 (31.7)</td>
<td>63</td>
</tr>
<tr>
<td>40-week review</td>
<td>6 (33.3)</td>
<td>1 (5.6)</td>
<td>8 (44.4)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>18</td>
</tr>
<tr>
<td><strong>Former smoker</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preimplementation review</td>
<td>0 (0.0)</td>
<td>44 (28.2)</td>
<td>82 (52.6)</td>
<td>26 (16.7)</td>
<td>73 (46.8)</td>
<td>26 (16.7)</td>
<td>46 (29.5)</td>
<td>156</td>
</tr>
<tr>
<td>24-week review</td>
<td>0 (0.0)</td>
<td>53 (55.8)</td>
<td>73 (76.8)</td>
<td>24 (25.3)</td>
<td>39 (41.1)</td>
<td>7 (7.4)</td>
<td>38 (40.0)</td>
<td>95</td>
</tr>
<tr>
<td>40-week review</td>
<td>0 (0.0)</td>
<td>8 (34.8)</td>
<td>14 (60.9)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>23</td>
</tr>
</tbody>
</table>

Figure 3. Change in algorithm measures for patients currently smoking between preintervention and postintervention (24 weeks) chart reviews: Error bars indicate 95% CIs.

Figure 4. Sustainability chart reviews performed 40 weeks after the intervention: Error bars indicate 95% CIs.
translate into a study sample increase in mood treatment. Physicians were able to intervene if warranted in the initial screening or if concerns developed concurrent with tobacco reduction and cessation. This study might not have been sensitive enough to follow patients to determine whether patients had changed their tobacco use patterns for a sufficient length of time to observe mood changes that required treatment.

The findings from this study reaffirm the substantive and important role of the system in which treatment is delivered in physicians’ practices. Tobacco clinical system pathways in primary care settings have been demonstrated to result in significant reductions of patient smoking prevalence ($P < .01$) and rates of office visits for smoking-related diseases ($P < .05$).17

**Limitations**
In this study, the project team had a substantive role in facilitating the development and adoption of the clinical system pathway at each site. Although clinical system pathways should be viewed as central to tobacco intervention strategies in primary care, the importance of the considerable contribution of external support provided by the project team cannot be overlooked in future dissemination of this approach.

The study findings must be interpreted with caution. The sample is likely not representative, as physicians self-selected to participate and entered the study with positive intentions to treat tobacco use disorders. Because we limited the sustainability audit reviews to the first 30 physicians who completed the study, there might have been a biased selection of the most enthusiastic physicians recruited. It is likely that there are different levels of readiness to treat tobacco use disorders among physicians and health care systems. However, these findings do reflect the real-world experiences of primary care practices, and because intention-to-treat statistical analysis was used, the study findings cannot be considered artificially inflated.

**Conclusion**
In this study, positive sustained changes were observed in the adoption of the tobacco clinical system pathway, as well as in 6 of the 8 tobacco maneuvers 24 weeks following its implementation. Physicians also demonstrated favourable changes on 9 of the 12 measures of treatment intention. These findings suggest that the provision of a tobacco clinical system pathway that incorporates the primary health care team, that builds on existing office infrastructures, and that is facilitated through external support will support positive and sustainable changes in primary care. The study reaffirms the substantive and important role of multidisciplinary approaches and clinical system pathways in primary care physicians’ practices.

**Dr Kunyk** is Assistant Professor in the Faculty of Nursing, Adjunct Professor in the John Dossetor Health Ethics Centre, and Associate Researcher in the Centre for Effective Business Management of Addiction Treatment at the University of Alberta in Edmonton. **Dr Els** is an academic faculty member in the Faculty of Medicine and Dentistry, the School of Public Health, and the John Dossetor Health Ethics Centre at the University of Alberta. **Dr Papadakis** is Assistant Professor in the Division of Cardiology in the Faculty of Medicine and Dentistry, the School of Public Health, and the John Dossetor Health Ethics Centre at the University of Alberta. **Dr Selby** is Chief of the Addictions Program and Clinician Scientist at the Centre for Addiction and Mental Health in Toronto; Ont, Associate Professor in the Department of Family and Community Medicine, the Department of Psychiatry, and the Dalla Lana School of Public Health at the University of Toronto, and Principal Investigator at the Ontario Tobacco Research Unit.

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**Contributors**
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**Competing interests**
None declared.

**Correspondence**
**Dr Diane Kunyk**, University of Alberta, Faculty of Nursing. Level 3, Edmonton Clinic Health Academy, 11405-87 Ave, Edmonton, AB T6G 1C9; telephone 780 492-9264; fax 780 492-2551; e-mail diane.kunyk@ualberta.ca

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