

Original Investigation

Smoking cessation for hospitalized smokers: An evaluation of the “Ottawa Model”

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Abstract

Introduction: Interventions for hospitalized smokers can increase long-term smoking cessation rates. The Ottawa Model for Smoking Cessation (the “Ottawa Model”) is an application of the “5 A’s” approach to cessation, customized to the hospital setting. This study evaluated the impact of implementing the Ottawa Model in 9 hospitals in eastern Ontario.

Methods: The RE-AIM (Reach, Efficacy, Adoption, Implementation, and Maintenance) framework was used to evaluate the intervention. Trained outreach facilitators assisted 9 hospitals to implement the Ottawa Model; program delivery was then monitored over a 1-year period using administrative data and data from a follow-up database. A before-and-after study was conducted to gauge the effect of the Ottawa Model program on cessation rates 6 months after hospitalization. Self-reports of smoking cessation were biochemically confirmed in a random sample of patients, and all cessation rates were corrected for potential misreporting.

Results: Sixty-nine percent of the expected number of smokers received the Ottawa Model intervention. Controlling for hospital, the confirmed 6-month continuous abstinence rate was higher after, than before, introduction of the Ottawa Model (29.4% vs. 18.3%; odds ratio = 1.71, 95% CI = 1.11–2.64; $Z = 2.43$; $P = 0\%$; $p = .02$). The intervention was more likely to accomplish counseling for smokers than delivery of medications or postdischarge follow-up. Attitudinal, managerial, and environmental challenges to program implementation were identified.

Discussion: Trained outreach facilitators successfully implemented the Ottawa Model in 9 hospitals leading to significantly higher long-term cessation rates. The public health implications of systematic cessation programs for hospitalized smokers are profound.

Introduction

Hospitalization provides a unique opportunity to identify and engage smokers, initiate cessation treatments, and facilitate appropriate follow-up and support (Emmons & Goldstein, 1992; Nicholson, Hennrikus, Lando, McCarty, & Vessey, 2000; Rigotti, Munafo, & Stead, 2007). Hospital-initiated interventions for smoking cessation that include inpatient treatment and follow-up after discharge generate significantly higher longer term quit rates compared to control conditions (odds ratio [OR] = 1.65, 95% CI = 1.44–1.90; Rigotti et al.). Notwithstanding, few hospitals have implemented such interventions. There are very few evaluations of the impact of implementing cessation interventions into routine hospital practice under “real-world” conditions.

At the University of Ottawa Heart Institute, a systematic approach to the identification, treatment, and follow-up of hospitalized smokers has been implemented (Reid, Pipe, & Quinlan, 2006). Now known as the “Ottawa Model for Smoking Cessation” (Ottawa Model), this program reflects an application of a “5 A’s” approach to cessation (ask, advise, assess, assist, and arrange; Fiore et al., 2008), customized for the hospital setting.

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The aim of the Ottawa Model is to increase the number of smokers who achieve long-term abstinence following hospitalization. This is accomplished by systematically identifying and documenting the smoking status of all admitted patients; providing evidence-based, best practice clinical interventions for tobacco dependence, including counseling and pharmacotherapy; and ensuring posthospitalization follow-up. Patients are followed after discharge using a unique interactive voice response (IVR)-mediated telephone follow-up system (Reid, Pipe, Quinlan, & Oda, 2007). The IVR system places automated telephone follow-up calls to patients 3, 14, 30, 60, 90, 120, 150, and 180 days postdischarge. It delivers a standardized set of questions (maximum of 10) with prerecorded voice prompts to establish patient identity, smoking status (e.g., "Have you smoked any cigarettes since you were last contacted?"), and current use of smoking cessation therapies (e.g., "Are you using nicotine patches?"; "Are you using Champix?"; "Have you received counseling for smoking cessation?"). Using branching logic, the IVR system then poses different questions to patients who are smoke-free versus those who have relapsed to smoking. For patients who are smoke-free, the system queries confidence in remaining smoke-free (e.g., "On a scale of 1 to 5, how confident are you that you can remain smoke-free?") and provides a reinforcing message. For patients who have relapsed to smoking, the system queries the amount smoked and interest in making a further quit attempt; it then provides a supportive message. Each IVR call lasts approximately 3 min. Because the IVR system is able to interpret natural speech and convert speech to data, patient responses to questions are documented and maintained in a relational database. Results and outcomes can be viewed and monitored by nurse counselors who are then able to respond individually to particular patient needs. Long-term quit rates increased by 15% (from 29% to 44%) following implementation of the program at our own institution (Reid et al.).

In 2006, implementation of the Ottawa Model was expanded to several hospitals in eastern Ontario. Wider dissemination of the Ottawa Model required the development of processes to change clinical practices among staff providing care to hospitalized smokers. Key predisposing, enabling, and reinforcing factors for changing clinical practices were identified from meta-analyses of hospital-based cessation interventions (Fiore et al., 2000; Rigotti, Munafo, Murphy, & Stead, 2003; Wolfenden, Campbell, Walsh, & Wiggers, 2003), reviews of interventions to transform professional practice (Grol & Grimshaw, 2003), and our experiences implementing this program at our institution (Reid et al., 2003, 2006, 2007). Specially trained outreach facilitators (Hogg, Baskerville, Nykiforuk, & Mallen, 2002; Hogg et al., 2008; O'Brien et al., 2007) assisted hospitals with program implementation.

In the present study, an evaluation of the implementation of the Ottawa Model in nine eastern Ontario hospitals is presented.

Methods

Evaluation framework

The evaluation was guided by the RE-AIM (Reach, Efficacy, Adoption, Implementation, and Maintenance) framework (Glasgow, Vogt, & Boles, 1999). The RE-AIM framework suggests several dimensions of quality need to be assessed to fully

evaluate the impact of a program. In this article, reach, efficacy, adoption, and implementation are reported; maintenance will be considered at a later date.

Evaluation design

Trained outreach facilitators assisted hospitals in implementing the Ottawa Model and monitored program delivery at each hospital over a 1-year period using administrative data and data from the IVR follow-up system's database. A preimplementation and postimplementation evaluation was conducted to gauge the effect of the program on cessation rates 6 months after discharge. Self-reports of smoking cessation were confirmed using expired carbon monoxide (CO) in a random sample of participants from a single hospital. All cessation rates were corrected for potential misreporting. Approval of the investigation was granted by the University of Ottawa Heart Institute Human Research Ethics Board.

Setting

This evaluation was conducted in nine eastern Ontario hospitals. Hospital size ranged from small rural community hospitals to large urban academic teaching centers.

Recruitment of hospitals

An E-mail offering the opportunity to implement the Ottawa Model was sent to the chief executive officer of the 19 hospitals in the region in November 2006. All hospitals in the region agreed to implement the Ottawa Model; however, due to resource limitations, the implementation process was staged. The nine hospitals included in the present evaluation were part of the first implementation wave. It was not necessary to agree to implement the Ottawa Model across all units in any given hospital in order to participate.

Preintervention data collection

A consecutive series of patients admitted over a monthlong period to hospital units planning to implement the Ottawa Model were asked about their smoking status by a designated staff member. A smoker was defined as anyone who had smoked any form of tobacco in the 6 months prior to hospital admission. All smokers were asked whether they would be willing to be contacted following discharge. Those who agreed constituted a control group for determining preimplementation quit rates. Patients were excluded from the control group if they died during hospitalization, they were receiving palliative care, they were <18 years of age, they were transferred to another hospital, or they spoke neither English nor French. Patients in the control group were contacted by telephone by study staff 6 months after discharge, and their smoking status was determined.

Intervention

Two nurses and one master's trained health science graduate were employed as outreach facilitators; they were trained in clinical aspects and implementation protocols related to the Ottawa Model. Each facilitator was assigned up to four hospitals; there was only one facilitator per hospital. The facilitators implemented several strategies to change tobacco-dependence treatment practices within participating hospital units (Table 1). Such strategies were delivered in two phases: (a) a start-up

Table 1. Program activities and intervention strategies

Activities and intervention strategies	Description
Meet with key hospital officials	Meeting with administrative, medical, and nursing leadership at the hospital Recording hospital characteristics Signing partnership agreement
Baseline audit and feedback	Review of current policies and practices related to tobacco-dependence treatment for hospitalized smokers Patient survey of smoking prevalence Presentation of baseline policies and practices in relation to “best practices” and smoking prevalence data to hospital leadership
Consensus building	Setting goals to improve practice gaps Reviewing ways for integrating care for hospitalized smokers into routine practice
Accountability	Designating care provider most responsible for delivering tobacco-dependence treatment
Practice tools	Standardized smoker consult form Standard orders for smoking cessation medications Patient education materials Interactive voice response–mediated follow-up system
Reminder systems	Standardized smoking status questions on intake histories Tobacco-dependence treatment on care maps, clinical pathways, and Kardex systems
Educational outreach visits	Regular meetings between program facilitators and implementers to solve the problem and assist with practice change activities
Training	Smoking cessation opinion leader(s) Physicians Frontline staff Clerks
Ongoing audit and feedback	Quarterly presentation of program results to unit managers and hospital leadership Presentation of results to frontline staff

phase—involving preparation for program delivery and (b) an operational phase—during which program operations commenced and refinements occurred.

The start-up phase commenced with a meeting with key hospital officials to secure high-level commitment to the program. Facilitators then worked with hospital staff to review current tobacco-dependence treatment policies and practices. Information on policy/practice gaps and smoking prevalence (gathered during preimplementation data collection) were presented to hospital leaders. Facilitators and hospital leaders established goals to reduce practice gaps and ensure an optimal environment for tobacco-dependence treatment. Hospital leaders identified staff responsible for ensuring tobacco-dependence treatment for smoker patients. Key staff-level implementers attended an intensive 4-day training program in which they learned about tobacco-dependence treatment and how to operationalize the Ottawa Model within their hospital unit. **Facilitators worked with staff-level implementers to introduce clinical practice tools, including a standardized smoker consult form, standard orders for smoking cessation medications, standardized patient education materials, and the IVR follow-up system and database.** Point-of-care reminders were introduced including standard smoking status questions on admission and patient history forms (i.e., “Have you used any form of tobacco in the past 6 months?” and “Have you used any form of tobacco in the past 7 days?”), and interventions for smoker patients were added to patient care maps. Frontline physicians and nurses were trained during a 1-hr session addressing principles of tobacco-dependence treatment and smoking cessation medications; they were given instructions regarding the smoking cessation consult

form and standard orders for cessation medications. **Ward clerks were trained to enter smokers’ information into the IVR follow-up system and database.** The start-up phase lasted 6 months or until the facilitator felt that the implementing units were ready to begin program delivery. Throughout the start-up phase, facilitators held regular meetings (approximately every 2–3 weeks) with staff-level implementers to assist with practice change activities. Smoking cessation program delivery then commenced. Commencement of program delivery often varied between units in the same hospital.

For program delivery, the cessation intervention was typically initiated by the patient’s attending nurse, although three of the nine hospitals had dedicated nurse specialists providing the intervention. The bedside intervention was structured in accordance with the smoking cessation consult form, which contained questions and prompts concerning smoking history, previous quit attempts, confidence in quitting, readiness to quit smoking, nicotine withdrawal symptoms, and contact information for follow-up. The nurse discussed medication options with the patient and, as appropriate, completed the standard order for cessation medication to be signed by an attending physician. **Patients were informed about the IVR follow-up system in hospital and could choose whether or not to receive the IVR calls. The ward clerk entered information from the smoking cessation consult form from all smokers into a web-based data entry form. These data were sent to a secure server hosted by a third-party IVR service provider (TelAsk, Ottawa, Canada), which placed the automated follow-up telephone calls to patients in the database who indicated that they wished to receive follow-up after hospital discharge.**

The IVR follow-up system was monitored centrally by nurse counselors at the University of Ottawa Heart Institute; they provided assistance to smokers requiring additional support following discharge. Patients who identified that they had resumed smoking but wanted to make another quit attempt or who indicated that their confidence in remaining smoke-free was low were identified by the software interface of the IVR system prompting a live call from a nurse counselor. Participants who had returned to smoking but wished to make another quit attempt were assisted to identify a quit date, make preparations for quitting, and access cessation medications. Those nonsmoking participants whose confidence in remaining smoke-free was low received appropriate encouragement, strategic advice, and ongoing follow-up from the nurse counselor.

During the operational phase, educational outreach visits by facilitators continued on a quarterly basis; telephone contact between facilitators and implementers occurred as needed. Typically, these contacts focused on troubleshooting operational issues and challenges (e.g., staff compliance, unsupportive physicians, difficult patients, and newly identified training needs). Program results (i.e., number of smokers identified and treated and quit rates) were presented to frontline staff, unit managers, and hospital leaders on a quarterly basis. Adjustments to implementation processes (e.g., improving accountability and providing additional training) were made based on results.

Postimplementation data collection

After hospital units had implemented and delivered the Ottawa Model program for at least 1 year, postimplementation data were collected. A consecutive series of patients admitted over a monthlong period were asked about their smoking status by a designated staff member. All smokers were asked whether they would be willing to be contacted following discharge. Those who agreed comprised an experimental group for determining postimplementation quit rates. Patients in the experimental group were contacted by telephone by study staff 6 months after discharge, and their smoking status was determined using procedures identical to preimplementation data collection.

We conducted postimplementation interviews with the three outreach facilitators, along with five hospital administrators, and five staff-level implementers to identify potential barriers and challenges to the adoption of the Ottawa Model.

Measures

Reach. Reach was defined as the proportion of the expected number of smokers admitted to participating hospital units that received the Ottawa Model intervention. Characteristics of smokers receiving the intervention were also summarized. Unit-level and patient-level data were used. The expected number of smokers was estimated from the number of annual admissions to the unit multiplied by the prevalence of smoking determined from the preintervention data collection. The actual number of smokers receiving intervention was determined from the number of smoker consult forms completed and entered into the IVR follow-up database. Patient-level characteristics of those receiving intervention (e.g., demographic, smoking-related, and diagnostic) were also obtained from the IVR follow-up system's database.

Efficacy. Continuous abstinence, that is, no smoking from the time of hospital discharge to 6-month follow-up, before and after implementation of the Ottawa Model at each hospital was the efficacy measure. Continuous abstinence for 6 months is a practical marker of a smoker's ability to remain abstinent indefinitely (West, Hajek, Stead, & Stapleton, 2005). It was not feasible to confirm self-reports of nonsmoking in all control and experimental participants. Smoking status was confirmed in all control and experimental participants admitted with an acute coronary syndrome from a single hospital who self-reported nonsmoking at follow-up. Smokers with acute coronary syndrome have higher misreporting rates for smoking abstinence than other smoker populations (Pell et al., 2008). A research assistant invited participants to come to the hospital to provide an expired CO sample or made plans to collect the sample at a location convenient to the participant. Smoking abstinence was confirmed by a CO reading of ≤ 9 ppm (West et al.). If a CO sample could not be obtained, the participant was counted as a smoker. The misreporting rate for control and experimental participants was used to adjust results for all hospitals to provide a conservative estimate of quitting success.

Adoption. Hospital-level data were used to determine program adoption. The principal indicator of adoption was the proportion of the total number of nursing units within a hospital that implemented the Ottawa Model. Numbers of nursing units and units adopting the program were collected during initial meetings with hospital leaders.

Implementation. Implementation referred to the extent to which the program was delivered as intended. At the hospital level, the proportion of smokers admitted to participating units for whom a consult form was completed, smoking cessation medications were prescribed, and telephone follow-up were received were examined. Since counseling is prompted and conducted in the course of completing the smoker consult form, all smokers with consult forms completed were assumed to have received counseling. At the patient level, the number of IVR calls completed and the amount of nurse counseling during follow-up were also measured. Implementation data were obtained from the IVR follow-up system's database.

Statistical analysis

Data analyses were performed using SPSS 17.0 (SPSS Inc., Chicago, IL) and Review Manager 5.0 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark). Characteristics of smokers receiving the intervention were summarized using descriptive statistics (e.g., frequencies, means, and *SDs*). For efficacy, self-reported smoking abstinence rates for the control and experimental groups from each hospital were adjusted using misreporting rates from the CO confirmation study in acute coronary syndrome patients. The adjusted log *OR* for confirmed smoking cessation in the experimental versus control group for each hospital was determined by logistic regression. Covariates in the analyses included age, gender, cigarettes per day before hospitalization, and hospitalization for a smoking-related diagnosis (yes/no). Adjusted log *ORs* and *SEs* from the logistic regression were entered into Review Manager 5.0 using the inverse variance method, creating an overall *OR* for the effect of the Ottawa Model intervention.

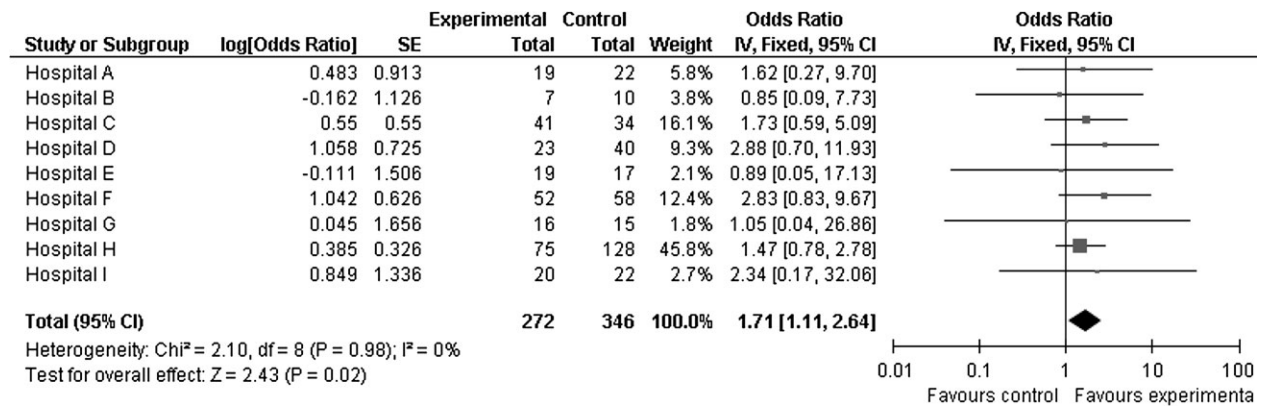


Figure 1. Forest plot of odds ratios for confirmed continuous smoking abstinence before (control) and after (experimental) implementation of the Ottawa Model for Smoking Cessation at nine hospitals.

Results

Reach

During the yearlong observation period, 2,818 smokers received intervention, representing 69% of the estimated 4,061 smokers admitted to participating units. Between hospitals, reach ranged from 29% to 97%, with a median of 60%. Smokers receiving intervention were 55.6 ± 17.4 years of age; 60% were male. They had long smoking histories (32.6 ± 16.4 years smoked) and were highly nicotine dependent (58% smoked within 30 min of awakening and 39% smoked more than 20 cigarettes/day). Sixty-seven percent were hospitalized with a diagnosis known to be causally related to smoking (US Department of Health and Human Services, 2004).

Efficacy

Smoking prevalence was 19.8% among a consecutive series of 2,225 admissions screened during the preintervention data collection. Of the 441 smokers, 360 (81.7%) agreed to be contacted after hospitalization; they comprised the control group for determining preimplementation quit rates. Over the 6-month follow-up period, 14 (3.9%) control group participants died. Follow-up data were available for 77.0% of participants. Smoking prevalence was 19.7% among a consecutive series of 1,683 admissions screened during the postintervention data collection, 1 year after the program became operational. Of the 332 smokers, 275 (82.9%) agreed to be contacted after hospitalization and constituted the experimental group for determining postimplementation quit rates. Over the follow-up period, three (1.1%) experimental group participants died; follow-up data were available for 74.4% of participants. Participants who died were excluded from the analyses (West et al., 2005). All other participants lost to follow-up were counted as smokers.

The CO confirmation study included a random sample of 43 patients admitted to one hospital with an acute coronary syndrome who self-reported smoking abstinence at 6-month follow-up. Smoking abstinence was confirmed in 36 (83.7%) of 43 patients. The misreporting rate was 15.3% and 16.6% in the control versus experimental groups, respectively ($p = .917$).

Odds ratios for confirmed continuous smoking abstinence before (control) and after (experimental) implementation of

the Ottawa Model at the nine participating hospitals are shown in Figure 1. Controlling for hospital, the abstinence rate was higher after, than before, introduction of the Ottawa Model (29.4% vs. 18.3%; $OR = 1.71$, 95% $CI = 1.11-2.64$; $Z = 2.43$; $I^2 = 0\%$; $p = .02$). Abstinence rates uncorrected for potential misreporting were 35.3% and 21.6% in the experimental and control groups, respectively ($OR = 1.97$, 95% $CI = 1.38-2.81$; $p < .001$).

Adoption

Adoption referred to the proportion of the total number of nursing units within a particular hospital that implemented the Ottawa Model (Table 2). Overall, adoption was 34% (28 of 82 nursing units across the hospitals adopted the Model). Between hospitals, adoption ranged from 4% to 100%. Program adoption was more complete in smaller hospitals (<10,000 inpatient hospitalizations per year) compared with large hospitals ($\geq 10,000$ hospitalizations per year).

Implementation

Implementation results are shown in Table 2. Consult forms were completed and entered for 69% of the expected number of smokers; since counseling is prompted and conducted in the course of completing the consult form, those with consult forms completed were assumed to have received counseling. Smoking cessation medications were prescribed to 29% of the expected number of smokers, and 23% were enrolled in telephone follow-up. Between hospitals, rates of medication use ranged from 6% to 58%, while enrollment in follow-up ranged from 8% to 32%. For those enrolled in telephone follow-up, completion rates for the 3-, 14-, 30-, 60-, 90-, 120-, 150-, and 180-day IVR calls were 53%, 60%, 60%, 56%, 54%, 50%, 48%, and 50%, respectively. **IVR calls were considered complete if the participant provided responses to the first two questions (which establish respondent identity and smoking status).** Nurse counselors provided follow-up counseling to 415 participants. Participants requiring callback received 1.8 ± 1.9 calls from a nurse counselor. Each call lasted approximately 10 min.

Qualitative impressions from outreach facilitators, hospital administrators, and staff-level implementers

Interviews with outreach facilitators, hospital administrators, and staff-level implementers identified attitudinal, managerial,

Table 2. Characteristics of participating hospitals and process indicators of implementation success

Hospital	Inpatient hospitalizations per year, total	Number of nursing units in hospital	Number (%) of nursing units in hospital implementing intervention	Inpatient hospitalizations per year on implementing units	Smoking prevalence (%)	Expected number of smokers per year	Number (%) of expected smokers with completed consult form	Number (%) of expected smokers provided medications	Number (%) of expected smokers enrolled in follow-up
A	804	1	1 (100)	804	28	225	136 (60)	14 (6)	42 (14)
B	846	1	1 (100)	600	23	138	123 (89)	29 (21)	35 (25)
C	2,070	6	5 (83)	2,030	23	467	83 (18)	41 (9)	36 (8)
D	24,502	26	2 (8)	998	22	220	134 (61)	31 (14)	67 (30)
E	22,502	25	1 (4)	2,460	17	418	123 (29)	46 (11)	57 (14)
F	10,003	8	8 (100)	3,886	17	661	570 (86)	83 (13)	212 (32)
G	1,648	4	1 (25)	740	17	126	63 (50)	8 (6)	15 (12)
H	6,606	6	6 (100)	6,606	23	1,519	1,475 (97)	880 (58)	442 (29)
I	1,976	5	3 (60)	1,250	23	288	111 (39)	62 (22)	34 (12)
Total	70,957	82	28	19,374		4,061	2,818 (69)	1,194 (29)	940 (23)

and environmental challenges to adoption and implementation of the program. Attitudinal challenges included staff attitudes toward smoking and smokers. Attitudes affected clinical practice when staff designated to provide intervention were themselves smokers or held notions about smoking being a “lifestyle choice” or a sign of “weak character.” Facilitators and staff-level implementers believed that training about tobacco-dependence treatment helped transform these attitudes; anecdotally, there were reports of some staff quitting smoking after receiving training. Patient-level interventions can also increase demand for staff smoking cessation programs. Managerially, program implementation seemed more complete when formal and informal opinion leaders were engaged. Implementation quality was affected by unit-level management. If a clinical manager provided leadership and performance feedback, staff were more likely to implement tobacco-dependence treatments. Environmentally, smoke-free hospital grounds policies appeared to motivate hospital administrators and staff to implement processes to assist hospitalized smokers. Importantly, we provided no tangible financial incentives for hospitals/units to implement the Ottawa Model.

Discussion

Reach, efficacy, adoption, and implementation of the Ottawa Model were evaluated among smokers admitted to nine hospitals in eastern Ontario. Using outreach facilitators to assist hospitals to change clinical practices, the intervention reached a median of 60% of smokers hospitalized on participating units. Implementation was associated with a significant (West, 2007) absolute increase of 11% in the CO-confirmed 6-month continuous abstinence rate posthospitalization (a 71% increase in the odds of smoking abstinence). The intervention was more likely to accomplish counseling for smokers than delivery of medications or postdischarge follow-up.

The 11% improvement in cessation rates is similar to our experience with smoker patients with cardiac disease (Reid et al., 2006). Comparatively, Rigotti et al. (2007) showed that interventions that included hospital contact plus follow-up >1

month improved the long-term quit rate among hospitalized patients, unselected by diagnosis, from 12.4% to 16.0%; among patients with cardiovascular disease, the long-term quit rate increased from 30.9% to 45.3%. Smoking prevalence among hospitalized patients in our study was 20%, similar to prevalence rates of 15%–36% published for general hospital populations in countries with similar population prevalence for smoking (Hjalmarsen & Boethius, 2007; Katz, Goldberg, Smith, & Trick, 2008; Kouimtsidis et al., 2003; Peach, 2002; Shourie, Conigrave, Proude, & Haber, 2007).

This evaluation demonstrates that effective interventions for hospitalized smokers can be incorporated into routine practice across a variety of hospital settings using clinical rather than research staff (Rigotti et al., 2007). Outreach facilitators were used to guide hospitals through implementation of the Ottawa Model; previously, outreach facilitators have been used to transform practice in primary care settings (Hogg et al., 2002). The facilitators worked to (a) predispose to change by increasing knowledge and skills (e.g., generating initial knowledge about existing practices and their effects and creating opportunities for interaction between program implementers, frontline staff, and outreach facilitators through training and ongoing contacts), (b) enable change by promoting favorable conditions in the practice environment (e.g., gaining commitment from senior hospital leaders, embedding the treatment of smokers into usual hospital routines, and installing the IVR follow-up system to make it easy to link smokers into effective postdischarge follow-up and counseling programs), and (c) reinforce change through outcome tracking and performance feedback. Outreach facilitators, hospital administrators, and staff-level implementers identified several challenges to adoption and implementation of the program that will be of interest to others planning similar multilevel interventions.

A limitation of this evaluation is the pre–post design used to gauge efficacy. It is possible that the groups were different with respect to unmeasured factors that affected posthospitalization smoking cessation rates (e.g., depression and education). Our analyses did, however, adjust for age, gender, amount smoked, and reason for hospitalization (smoking related or not). To our

knowledge, there were no significant changes in the hospital environments that may have prejudiced the outcome. All posthospital follow-up counseling was monitored and provided by the University of Ottawa Heart Institute, potentially limiting generalizability of the results. Having a single hospital within a regional health authority doing follow-up with smokers from all hospitals, in fact, facilitated the participation of many hospitals.

The importance of smoking cessation as a preventive strategy is unparalleled. It is mystifying that hospitals have not, until recently, begun to address this public health challenge in a systematic manner. This investigation has shown that it is feasible to introduce systematic interventions for smoking cessation to the general hospital setting in a way that can significantly influence smoking cessation success. The provision of sensitive care to smoker patients at the time of admission ensures, in the first instance, the prevention and treatment of nicotine withdrawal—enhancing patient comfort and facilitating compliance with treatment while ultimately increasing the likelihood of smoking cessation. The use of innovative technologies permits the management and follow-up of large numbers of smokers following hospital discharge. The public health implications of implementing systematic approaches to smoking cessation in every hospital are profound.

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Declaration of Interests

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References

- Emmons, K. M., & Goldstein, M. G. (1992). Smokers who are hospitalized: A window of opportunity for cessation interventions. *Preventive Medicine, 21*, 262–269.
- Fiore, M., Bailey, W., Cohen, S., Dorfman, S., Goldstein, M., Gritz, E., et al. (2000). *Clinical practice guideline: Treating tobacco use and dependence*. Rockville, MD: US Department of Health and Human Services, Public Health Service.
- Fiore, M. C., Jaen, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., et al. (2008). *Treating tobacco use and dependence: 2008 update*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service.
- Glasgow, R. E., Vogt, T. M., & Boles, S. M. (1999). Evaluating the public health impact of health promotion interventions: The re-aim framework. *American Journal of Public Health, 89*, 1322–1327.
- Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *Lancet, 362*, 1225–1230.
- Hjalmarsen, A., & Boethius, G. (2007). The effectiveness of brief advice and extended smoking cessation counseling programs when implemented routinely in hospitals. *Preventive Medicine, 45*, 202–207.
- Hogg, W., Baskerville, N., Nykiforuk, C., & Mallen, D. (2002). Improved preventive care in family practices with outreach facilitation: Understanding success and failure. *Journal of Health Services Research & Policy, 7*, 195–201.
- Hogg, W., Lemelin, J., Graham, I. D., Grimshaw, J., Martin, C., Moore, L., et al. (2008). Improving prevention in primary care: Evaluating the effectiveness of outreach facilitation. *Family Practice, 25*, 40–48.
- Katz, A., Goldberg, D., Smith, J., & Trick, W. E. (2008). Tobacco, alcohol, and drug use among hospital patients: Concurrent use and willingness to change. *Journal of Hospital Medicine, 3*, 369–375.
- Kouimtsidis, C., Reynolds, M., Hunt, M., Lind, J., Beckett, J., Drummond, C., et al. (2003). Substance use in the general hospital. *Addictive Behaviors, 28*, 483–499.
- Nicholson, J. M., Hennrikus, D. J., Lando, H. A., McCarty, M. C., & Vessey, J. (2000). Patient recall versus physician documentation in report of smoking cessation counselling performed in the inpatient setting. *Tobacco Control, 9*, 382–388.
- O'Brien, M. A., Rogers, S., Jamtvedt, G., Oxman, A. D., Odgaard-Jensen, J., Kristoffersen, D. T., et al. (2007). Educational outreach visits: Effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews, 4*, CD000409.
- Peach, H. G. (2002). Obesity, smoking and hazardous drinking among men admitted to the surgical wards of a regional hospital. *Australian Journal of Rural Health, 10*, 273–277.
- Pell, J. P., Haw, S. J., Cobbe, S. M., Newby, D. E., Pell, A. C., Oldroyd, K. G., et al. (2008). Validity of self-reported smoking status: Comparison of patients admitted to hospital with acute coronary syndrome and the general population. *Nicotine & Tobacco Research, 10*, 861–866.
- Reid, R., Pipe, A., Higginson, L., Johnson, K., D'Angelo, M. S., Cooke, D., et al. (2003). Stepped care approach to smoking cessation in patients hospitalized for coronary artery disease. *Journal of Cardiopulmonary Rehabilitation, 23*, 176–182.

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- Reid, R. D., Pipe, A. L., & Quinlan, B. (2006). Promoting smoking cessation during hospitalization for coronary artery disease. *Canadian Journal of Cardiology*, *22*, 775–780.
- Reid, R. D., Pipe, A. L., Quinlan, B., & Oda, J. (2007). Interactive voice response telephony to promote smoking cessation in patients with heart disease: A pilot study. *Patient Education and Counseling*, *66*, 319–326.
- Rigotti, N. A., Munafo, M. R., Murphy, M. F., & Stead, L. F. (2003). Interventions for smoking cessation in hospitalised patients. *Cochrane Database of Systematic Reviews*, *1*, CD001837.
- Rigotti, N. A., Munafo, M. R., & Stead, L. F. (2007). Interventions for smoking cessation in hospitalised patients. *Cochrane Database of Systematic Reviews*, *3*, CD001837.
- Shourie, S., Conigrave, K. M., Proude, E. M., & Haber, P. S. (2007). Detection of and intervention for excessive alcohol and tobacco use among adult hospital in-patients. *Drug and Alcohol Review*, *26*, 127–133.
- US Department of Health and Human Services. (2004). *The health consequences of smoking: A report of the surgeon general*. Rockville, MD: US Department of Health and Human Services, Public Health Service, Office of the Surgeon General.
- West, R. (2007). The clinical significance of “small” effects of smoking cessation treatments. *Addiction*, *102*, 506–509.
- West, R., Hajek, P., Stead, L., & Stapleton, J. (2005). Outcome criteria in smoking cessation trials: Proposal for a common standard. *Addiction*, *100*, 299–303.
- Wolfenden, L., Campbell, E., Walsh, R., & Wiggers, J. (2003). Smoking cessation interventions for in-patients: A selective review with recommendations for hospital-based health professionals. *Drug and Alcohol Review*, *22*, 437–452.