Episode-of-Care Analysis and Tobacco Treatment in Primary Care Settings

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Economists and health services researchers have long been faced with the problem of how to effectively unitize and assess cost and quality of health care delivery across diverse practice settings. One such approach is episode-of-care analysis, first theorized and applied by Hornbrook and his colleagues in the mid-1980s. A health care episode is defined as a series of health-related events with a beginning, an end, and a course, all related to a given health problem that exists over a specific time period (i.e., time horizon). In our research we have adapted an episode-of-care framework to the topic of treating tobacco use and dependence. Further reductions in tobacco use calls for increased readiness and capacity of primary care physicians to treat tobacco dependence (CDC 2002). However, Primary care providers face considerable pressure to address multiple patient care concerns during increasingly brief clinical visits (Cabana et al. 1999). Efforts to encourage adaptation of well-established clinical practice guidelines must address the tension between time limitations and best practices. We need techniques and tools to support sustainable change in practice related to tobacco dependence in diverse primary care settings, particularly those located in medically underserved communities (Davis and Taylor-Vaisey 1995; Hellinger 1996; Stone et al. 2002; Swartz et al. 2002; Wandersman 2003).

Our efforts are focused on how to improve dissemination and implementation of the U.S. Public Health Service Guideline for Treating Tobacco Use and Dependence in primary care practices (Foire et al. 1996). This line of work is especially timely, as the PHS Guidelines for Treating Tobacco Dependence are currently under revision and innovations to support dissemination are of especially high priority. Our system dynamics modeling will show the interdependent process of patients and providers cycling through various stages of tobacco use and treatment, and it will need to represent a patient's stage of readiness to quit or likelihood to avoid relapse.

Focus on Primary Care Practices

Brief counseling intervention by primary care providers has been shown to effectively promote tobacco use cessation, yet many physicians do not consistently adhere to this practice for all patients at each appointment (Davis and Taylor-Vaisey 1995; Goldstein et al. 1998; Greco and Eisenberg 1993). Significant barriers exist that can interfere with clinicians' assessment and treatment of smokers. Many clinicians lack knowledge about how to identify smokers quickly and easily, which treatments are efficacious, how treatments can be delivered, and the relative efficacies of different treatments (Orleans 1993). Even if clinical knowledge is strong, many physicians do not consistently use this intervention (Davis and Taylor-Vaisey 1995; Goldstein et al. 1998; Greco and Eisenberg 1993).

The Association of American Medical Colleges and the American Legacy Foundation (AAMC/Legacy Foundation), working in cooperation with the Center for Health Workforce Studies at the University of Albany, recently published an in-depth report on physician behavior and practice patterns related to smoking cessation (2007). The report noted that physicians do not address tobacco use and dependence among their patients as consistently and intensively as they might, citing work by the Centers for Disease Control and Prevention (2004) that indicates that no less than 70% of patients wanted to quit at any given time and that, although more than 80% of physicians report asking patients about whether or not they smoke, this level falls short of agreed upon national goals (Fiore et al. 2000; Katz et al. 2002). Moreover, far fewer physicians

routinely prescribe cessation pharmacotherapies or refer patients to counseling and other supports, as recommended in the guidelines (Thorndike et al., 1998; (Bourm 2000).

Shortage of Cessation Tools and Resources. The AAMC/Legacy Foundation (2007) study reported that a majority of physicians across specialties and settings reported significant limitations in the interventions they have available to help end their tobacco use. These included having too few cessation resources and organizational supports, as well as lacking interventions that are effective in helping them quit. Moreover, the study that access to more resources and organizational supports was associated with more active cessation interventions on the part of physicians.

Only half of physicians reported having any type of resource to aide in the delivery of tobacco treatment, such as informational posters and brochures for their waiting rooms (50%) or a tobacco user identification system (33%). When asked if they would refer patients to individual counseling and group programs should they be available, 90% of physicians said they would. However, only 10% of reporting physicians rated their ability to address smoking among their patients as "very effective." When physicians knew about the patients' insurance coverage and eligibility for medication and pharmacotherapy, counseling, and quitlines, they were more likely to engage their patients in smoking interventions.

Access to resources did not vary greatly across types of medical specialties. However, psychiatrists were found to be least likely to report that resources were available, with the exception of individual counseling. Among primary care providers, internists were more likely to report limited availability of resources, though they were also found to show higher levels active participation in smoking cessation interventions for their patients (see also Meredith et al. 2005).

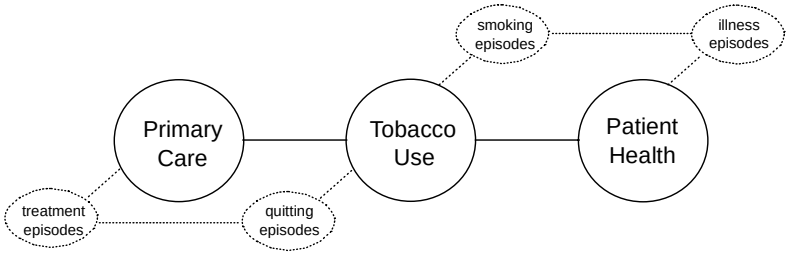
Other Barriers to Tobacco Treatment in Primary Care. Lack of patient motivation and poor financing of cessation activities were both reported as large barriers to addressing tobacco use and dependence in their patients. These results were also consistent with prior findings (see Adsit et al. 2005; Cabana et al. 1999; Glynn and Manley 1989). Physicians surveyed for the AAMC/Legacy Foundation (2007) report underscored that patients bear a considerable responsibility for choosing to smoke and for quitting. The most commonly endorsed physician-reported barrier identified by the AAMC/Legacy Foundation study was that patients are not motivated to quit (63%). Reimbursement of coverage for cessation interventions and limited reimbursement for office visits were key financial barriers (54% and 52%, respectively).

In addition, there was a general perception about the overall effectiveness of smoking cessation interventions. A majority of physicians reported that most cessation interventions have "some" effectiveness; however, less than one-third rated any single intervention as "highly" effective. Bupropion and nicotine replacement therapies (NRT) were assessed to be the most efficacious interventions by physicians. No differences were found in terms of assessment of interventions by physicians' subspecialty, organizational setting, or gender. Younger physicians and those whose medical training covered tobacco treatment were more likely to correctly assess intervention effectiveness.

Conceptual Framework for Development of the Simulation Tool

Our conceptual framework for development of the simulation tool is organized around three general domains of interest: (1) primary care, (2) tobacco use, and (3) patient health (see Figure 1). Tobacco use can be viewed as a mediator of patients' health and their use of primary care, in that everyone requires some level of primary care at some point (whether for an acute, chronic or preventive health matter) (Fetter et al. 1984; Ritzwoller et al. 2005). Moreover, we know that tobacco users are more likely to have respiratory, cardiovascular, gastrointestinal, and other chronic health problems and, therefore, are more likely to require primary care services (Rigotti 2002; Ritzwoller et al. 2005).

Figure 1 - Conceptual framework

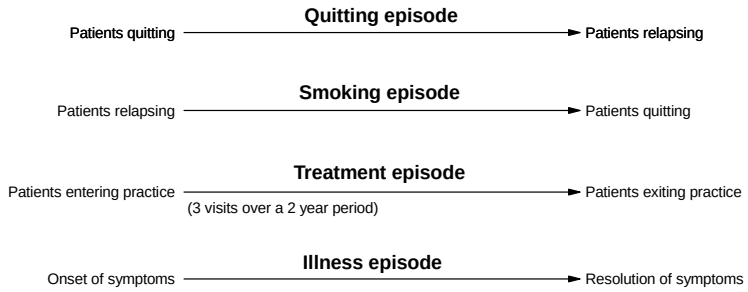


To represent the interdependent nature of these domains, we have chosen to adopt Hornbrook's fundamental concept of *health care episodes* (Hornbrook, Hurtado, and Johnson 1985). Hornbrook and his colleagues are economists and health services researchers whose work takes a theoretical approach to unitizing health care services and costs (Hornbrook et al. 2005). The concept of a health care episode is useful here because it "enables more appropriate assessment of costs of care and, in addition, lends itself to analysis of the processes as well as the outcomes of medical care" (Hornbrook, Hurtado, and Johnson 1985)(p. 164).

The concept of a health care episode lends itself to system dynamics analysis because it is a dynamic event, bounded by a variable length of time. A health care episode is defined as a series of health-related events with a beginning, an end, and a course, all related to a given health problem that exists over a specific time period. We have identified four types of episodes useful for modeling tobacco treatment interventions, namely: (1) smoking episodes, (2) quitting episodes, (3) illness episodes, and (4) treatment episodes (see Figure 2).

Quitting episodes and smoking episodes are the most concretely defined units in our model: they are bounded by the moment at which the patient stops using tobacco and the moment the patient resumes using tobacco, or relapses. Treatment episodes may be defined in many different ways. For our purposes, a treatment episode for tobacco begins when a patient makes his or her first office visit to physician's practice, as either a well patient or a sick one. Likewise, the treatment episode ends when the patient leaves a physician's practice, that is, he or she leaves the providers care or is lost to follow-up. More than 70% of those who use tobacco will make at least one visit to a physician each year (Cromwell et al. 1997). When physicians take this opportunity to intervene, studies have shown that patients are more likely to make a quit attempt and more likely to sustain long-term cessation (from 7% without to 30% with; Orleans & Alper, 2003).

Figure 2 - Health care episodes for tobacco treatment in primary care



An illness episode is arguably the most difficult episode to define, for it involves the patient and the doctor recognizing that a patient is afflicted with a particular medical condition, whether acute or chronic. For example, a common illness episode among smokers would be the period of time someone is sick with bronchitis, from the earliest stages of coughing through to the patient's full recovery.

With respect to the topic of treating tobacco use and dependence, we delineate two general goals: (1) to motivate patients who currently use tobacco to quit and, for those who quit, (2) to prevent their relapse. To understand how to facilitate achievement of these goals for any given patient, providers must assess their own preparedness and resources, as well the patient's readiness to change. The PHS Guideline presents research that describes how trained providers can assist patients at any stage of cessation, as conceptualized by Prochaska and colleagues' transtheoretical model, from pre-contemplation through maintenance, as well as when patients relapse (Prochaska, Delucchi, and Hall 2004; Prochaska and DiClemente 1992). We will explore principles of the transtheoretical model in our planned study, and we will view each treatment episode, or each provider-patient encounter, as a potential opportunity to intervene and to prompt quitting episode, or at least foster additional readiness to consider quitting. The experience of an illness episode is likely to compel one or more office visits, offering the opportunity to address their tobacco use (Easton et al. 2001; Katz et al. 2002; McBride et al. 1997; Sippel et al. 1999; Smith et al. 2003; Thompson et al. 1988).

Sample Partial Model and Simulation Output

To help illustrate how we plan to apply our conceptual framework and the notion of episodes-of-care to study tobacco treatment interventions in primary care settings, we present a stock and flow diagram of our current, partial sample model, using Vensim (Ventana Systems, Harvard, MA). A table that lists each of the 22 variables that currently comprise the model is also provided, organized by domain (i.e., either *Primary Care* and *Tobacco Use*; *Patient Health* is not yet featured in our partial model). The table shows each variable's name, its class (Auxilary, Flow, or Stock), type, and dimension. We provide a brief definition and/or relevant assumption to further explain how the variable is used (see appendix).

To demonstrate the current model's behavior, we have initialized the practice size to 400 patients (200 never smokers, 100 current smokers, and 100 former smokers). These proportions are based on population statistics of prevalence of smoking in a typical primary care practice (Bourm 2000; Easton et al. 2001; McBride et al. 1997; Sippel et al. 1999). For this practice population, we assume that 7% of patients will quit without assistance (Burkhalter 2005; Lamb et al. 2005; Webb, Simmons, and Brandon 2005). We also assume that about 7 out of 10 patients are at a moderately high level of readiness to quit (readiness = .70; scale: 0 → 1.0) (CDC 2005). The sample partial model is unitized in weeks and runs over a period of 100 weeks (25 months). We chose to unitize the model in weeks because we assume that most patients would not require more than one primary care office visit per week. Also, a week's time is short enough to allow reliable estimates of patient flow, staffing, and other important variables in the model (see Sample Partial Model in appendix).

We generated results of three possible intervention scenarios, namely that the counseling intervention delivered to a patient lasted 3 minutes (minimal), 7 minutes (brief), or 15 minutes (full), per the PHS Guideline and as summarized by Cromwell et al. 1997; Table 1). Results of this baseline scenario run indicate that, as expected more intervention time per patient yields

Table 1 - Resource untilization assumptoins (Cromwell et al., 1997)[1]

Interventions for primary care physicians	Intervention time (minutes) Min counseling	Brief counseling	Full counseling
Screening for tobacco use			
Registerd nurses	1	1	1
Advice to quit			
Physician alone	1	1	1
Initial cessation counseling			
Physician alone	3	7	15
Physician with patch or gum	6	10	18
Follow-up counseling			
First follow-up physician visit	3-6	10	10
Second follow-up physician visit	-	-	10

Intensive interventions for smoking cessation specialists	Intervention time (minutes)[2] Individual intensive[3]	Group intensive[4]
Screening for tobacco use		
Registered nurse	1	1
Advice to quit		
Physician	1	1
Cessation counseling sessions		
Physician	10	20
Registered nurse	80	400
Psychologist	60	400

[1]Data from Fiore et al.

[2]Patients referred to a smoking cessation specialist are first screened in an office and advised to qite by a primary care provider.

[3]Counseling time for 'Individual intensive' patients are distributed over five 30-minute sessions.

[4]Counseling time for 'Group intensive' patients are distributed over 7 1-hour sessions.

higher quit rates. However, in this practice, the model shows that more patients are relapsing thatquitting, on a weekly basis, over the specified time period (see sample output in appendix).

In our planned study (currently under review by the NIH), we will continue developing our sample partial model in collaboration with an expert advisory group and a sample of community-based primary care practices. The participating practices will aide our formative assessment the system dynamics model. The formative assessment will examine: (1) feasibility and acceptability of using the simulation tool in an academic detailing intervention, (2) changes in individual provider attitudes about and practices in tobacco treatment, (3) and implementation of new or improved office systems to improve tobacco treatment at the practice level. We hypothesize that system dynamics modeling of the practice environment will promote deeper understanding of and greater impetus to implement the PHS Guideline.

Our planned study will be nested within *Queens Quits!*, a larger, on-going statewide initiative to disseminate and implement the PHS Guideline into clinical practice via a network of 19 Tobacco Cessation Centers, funded by the New York State Department of Health (NYSDOH). Memorial Sloan-Kettering Cancer Center (MSKCC) colleagues (Ostroff and Lounsbury) provide expertise in tobacco cessation treatment and program evaluation to *Queens Quits!*

Planned Application of the Model: Academic Detailing to Change Provider Practices

Academic detailing interventions typically involved multiple components, including provision of written materials and sample supplies, didactic training, auditing (with feedback), 'reminder' systems, and one or more office-based consultations (Gandjour and Lauterbach 2005; Goldstein et al. 2003; Soumerai and Avorn 1990). A recent Cochrane review by O'Brien and colleagues (O'Brien et al. 2005) examined the effectiveness of educational outreach visits, or academic detailing, to promote changes in medical and health care provider practices. In 13 of 18 randomized trials examined, the targeted provider behavior was prescribing practices. Three studies addressed preventive practices, including brief counseling for smoking cessation (Avorn et al. 1992; Berings, Blondeel, and Harbraken 1994). Collectively, these efforts help detailers establish a rapport with providers that, in turn, can generate effective change in practices.

Although positive outcomes were observed in all studies in the review, interventions that provided one or more of the following, including individual instruction, used audit and feedback strategies, incorporated review by peers, and that successfully integrated 'reminder' systems, were among the most effective for medical professionals (Dietrich et al. 1992; Steele et al. 1989) (Andrews et al. 2001; Kiefe et al. 2001; Weissman et al. 1999; Wensing and Grol 1994; Yano et al. 1995). Results did not reveal a clear relationship between the number of office visits by detailers and impact on the provider, although it was noted that interventions with as few as one or two visits had positive effects. Overall, academic detailing appears to be a promising way to change provider behaviors, especially when the behavior was prescribing medications. However, additional research on interventions intended to change preventive practices, including tobacco treatment practices (Goldstein et al. 2003), is needed. Although dissemination-only strategies (e.g., conferences and mailings) always demonstrated smaller effects than interventions involving outreach visits or peer review, such interventions had varying levels of effective impact (Oxman et al. 1995).

We believe that the system dynamics modeling approach has the potential to transform how clinical guidelines and scientific reviews are disseminated to busy professionals. A well-

designed simulation tool could greatly accelerate the rapport-building process between detailers and providers. We hypothesize that the capability to automatically simulate the dynamics of implementing practice changes during the course of either a didactic training session and/or an office-based consultation would help an academic detailer quickly learn about a provider's practice environment and help providers make practice-specific, cost-effective decisions about how to most efficiently and rapidly attain (and/or sustain) evidence-based standards of tobacco treatment for their patients. A tool with this capability would allow for quick comparison of alternative ways of changing office procedures by generating scenarios that simulate different combinations of role-sharing or resource exchange.

The system dynamics simulation tool we envision would be able to generate customized output, on the spot, in the form of easy-to-read behavior-over-time charts and data tables. Results would give a dynamic picture of demand on providers as well as patient outcomes over a specified period of time. It could show how, for example, adding tobacco treatment time during office visits will impact wait times over the course of a single day, or how combination NRT impacts relapse rates for heavy smokers over a three year period. More generally, our completed simulation tool would help providers answer critical questions such as: Which staff members should (and can) be involved in the practice's tobacco treatment strategies? How effective are minimal interventions, such as clinician advice to stop smoking, for our patients, or are more intensive interventions required? How does the duration of an intervention in number of treatment sessions or in total face-to-face contact time substantially influence efficacy for our patients? How much counseling time can we allocate during an office visit? What are the short-term and long-term costs of not effectively treating tobacco use, to the practice and to our patients? Which pharmacologic interventions will be easiest for our patients to adhere to and may lead to greater patient contact? How many times do patients relapse before they quit for good?

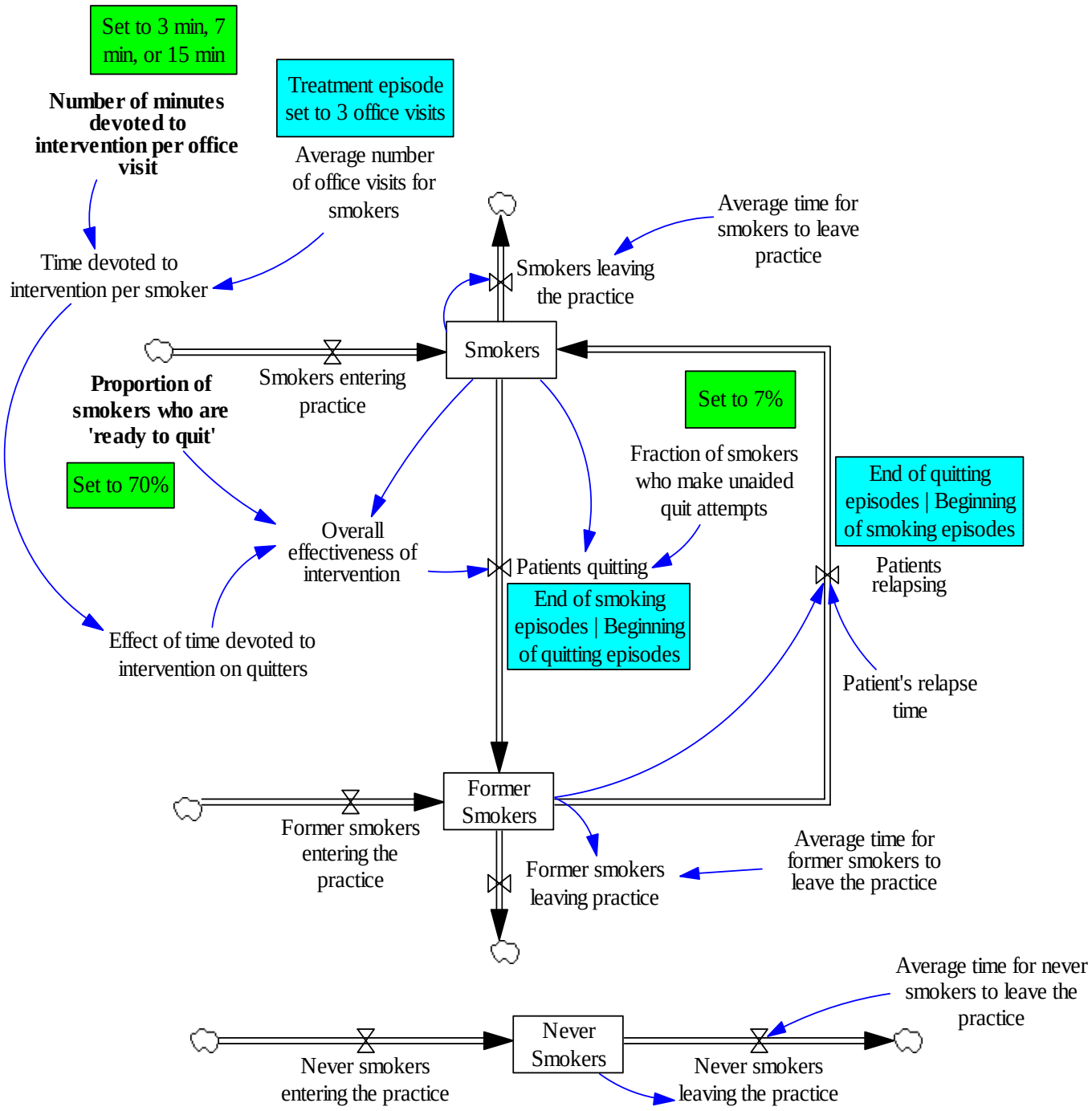
We expect that the capacity to address these types of questions with the simulation tool will help primary care providers visualize the implementation of various features of the tobacco treatment guidelines. In turn, we expect that providers will more quickly identify the mechanisms that will drive effective tobacco treatment in their own practices.

Summary

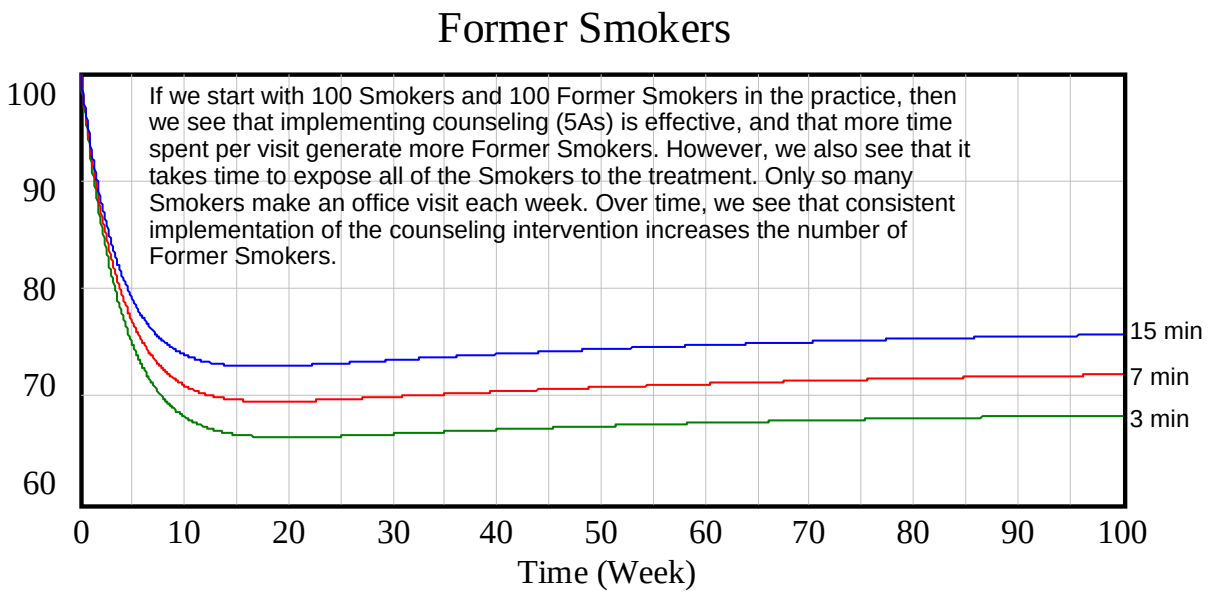
Our sample partial model is a starting point for a planned study with primary care physicians in New York City. Episode-of-care analysis has proven central to conceptualization and application of system dynamics to the problem of tobacco dependence and treatment in primary care. We will use the conceptual framework presented here as a theoretical blueprint to develop the simulation tool, integrating both professional knowledge and knowledge for improvement over the course of the model-building process.

Appendix

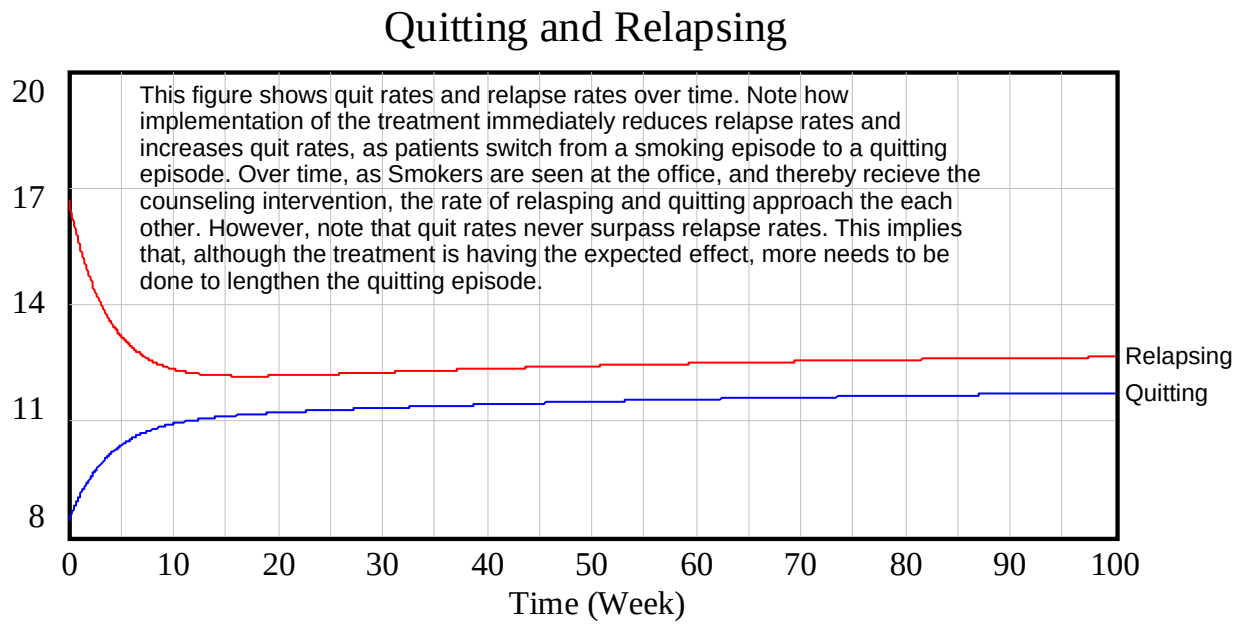
Sample Partial Model Stock and Flow Diagram



Sample Partial Model Output



Former Smokers : 15 min visit People
Former Smokers : 7 min visit People
Former Smokers : 3 min visit People



Patients quitting : 15 min visit People/Week
Patients relapsing : 15 min visit People/Week

Sample Partial Model Variable Definitions

Domain	Variable name	Variable Class	Variable Type	Definition/Assumption	Dimension
Primary Care	**Average number of office visits for smokers**	Auxilary	Constant	Set to 3. Constitutes an average treatment epidsode. Assumes no more than 1 session per week.	Office visits
Primary Care	**Average time for never smokers to leave the practice**	Auxilary	Constant	96 weeks (nearly 2 years).	Weeks
Primary Care	**Average time for former smokers to leave the practice**	Auxilary	Constant	72 weeks (nearly 1.5 years).	Weeks
Primary Care	**Average time for smokers to leave practice**	Auxilary	Constant	48 weeks (nearly 1 year).	Weeks
Primary Care	**Effect of time devoted to intervention on former smokers**	Auxilary	Variable (lookup table)	More time devoted, stronger effect.	1/Week
Primary Care	**Never smokers entering the practice**	Flow	Constant	Rate at which new patients join the practice.	People/Week
Primary Care	**Never smokers leaving the practice**	Flow	Draining process	Rate at which patients leave one practice for another, move away, die, etc.	People/Week
Primary Care	**Number of minutes devoted to intervention per office visit**	Auxilary	Constant	Set to either 3 minutes (minimal), 7 minutes (moderate), or 15 minutes (full) of tobacco counseling time (5As).	Minutes/Smoker/ Office visit
Primary Care	**Overall effectiveness of intervention**	Auxilary	Multiplic-ative	The number of smokers seen by a primary care physician X the effectiveness of the intervention X the patient's readiness to quit.	People/Week
Primary Care	**Patients relapsing**	Flow	Draining process	Rate at which patients patients who had quit start smoking again. Beginning of smoking episode. End of quitting episode.	People/Week
Primary Care	**Former smokers entering the practice**	Flow	Constant	2 per week. Rate at which new patients join the practice.	People/Week
Primary Care	**Former smokers leaving practice**	Flow	Draining process	Rate at which patients leave one practice for another, move away, die, etc.	People/Week
Primary Care	**Smokers entering practice**	Flow	Constant	2 per week. Rate at which new patients join the practice.	People/Week
Primary Care	**Smokers leaving the practice**	Flow	Draining process	Rate at which patients leave one practice for another, move away, die, etc.	People/Week
Primary Care	**Time devoted to intervention per smoker**	Auxilary	Multiplic-ative	The number of session per treatment epidsode X the average time allocated to tobacco counseling.	Minutes/Smoker
Tobacco Use	**Fraction of smokers who make an unaided quit attempt**	Auxilary	Fraction	The proporation of current smokers who quit without assistance from their provider.	dimensionless
Tobacco Use	**Never Smokers**	Stock	Initial value	Number of patients in practice who have never used tobacco.	People
Tobacco Use	**Patients quitting**	Flow	Draining process	Rate at which patients are quitting, once they are a patient at the practice. Beginning of quitting episode. End of smoking episode.	People/Week
Tobacco Use	**Patient's relapse time**	Auxilary	Constant	6 weeks. Expected time before a patient would relapse.	Week
Tobacco Use	**Former Smokers**	Stock	Initial value	Number of patients in practice who have quit smoking.	People
Tobacco Use	**Proportion of patients ready to quit**	Auxilary	Fraction	Patient's readiness level, on a scale from 0 (lowest) to 1.0 (highest).	dimensionless
Tobacco Use	**Smokers**	Stock	Initial value	Number of patients in practice who currently smoke	People

Note: Patient Health domain is not shown here.

References

AAMC/Legacy Foundation. 2007. Physician Behavior and Practice Patterns Related to Smoking Cessation - Summary Report. Washington, DC: Association of American Medical Colleges and American Legacy Foundation, in cooperation with Center for Health Workforce Studies.

Adsit, Robert, David Fraser, Lezli Redmond, Stevens Smith, and Michael C. Fiore. 2005. Changing clinical practice, helping people quit: The Wisconsin cessation outreach model. *Wisconsin Medical Journal* 104 (4):32-36.

Andrews, Jeannette, Martha S. Tingen, Jennifer L. Waller, and Rene J. Harper. 2001. Provider feedback improves adherence with AHCPR smoking cessation guideline. *Preventive Medicine* 33:415-421.

Avorn, J., S.B. Soumerai, D.E. Everitt, D. Ross-Degnan, M.H. Beers, D. Sherman, and et al. 1992. A randomized trial of a program to reduce the use of psychactive drugs in nursing homes. *New England Journal of Medicine* 327 (168-173).

Berings, D., L. Blondeel, and H. Harbraken. 1994. The effect of industry-independent drug information on the prescribing of benzodiazepine in general practice. *European Journal of Clinical Pharmacology* 46 (501-505).

Bourm, Marie L. 2000. A comparison of smoking cessation efforts in African Americans by resident physicians in a traditional and primary care medical residency. *Journal of the National Medical Association* 92 (3):131-135.

Burkhalter, JE, Springer, CM, Chhabra, R, Ostroff, JS, Rapkin, BD. 2005. Tobacco use and readiness to quit smoking in low income HIV-infected persons. *Nicotine & Tobacco Research* 7 (4):511-522.

Cabana, Michael D., Cynthia S. Rand, Neil R. Powe, Albert W. Wu, Modena H. Wilson, Paul-Andre. Abbound, and Haya R. Rubin. 1999. Why don't physicians follow clinical practice guidelines? *The Journal of American Medical Association* 282 (15):1458-1465.

CDC. 2002. Annual smoking-attributable mortality, years of potential life lost, and economic costs - United States, 1995-1999. *Morbidity and Mortality Weekly Report* 51:300-303.

CDC. 2005. Cigarette smoking among adults - United States, 2004. *Morbidity and Mortality Weekly Report* 54 (44):1121-1124.

Cromwell, J., W. J. Bartosch, Michael C. Fiore, V. Hasselblad, and Timothy B. Baker. 1997. Cost-effectiveness of the clinical practice recommendations in the AHCPR guideline for smoking cessation. *Journal of the American Medical Association* 278 (21):1759-1766.

Davis, D. A., and A. Taylor-Vaisey. 1995. Translating guidelines into practice: A systematic review of theoretical concepts and research evidence in the adoption of clinical practice guidelines. *CMAJ* 157:408-416.

Dietrich, A. J., G.T. O'Connor, A. Keller, P.A. Carney, D. Levy, and F.S. Whaley. 1992. Cancer: Improving early detection and prevention. A community practice randomized trial. *British Medical Journal* 304 (687-691).

Easton, Alyssa, Corinne Husten, Ann Marlarcher, Lisa Elon, Ralph Caraballo, Indu Ahluwalia, and Erica Frank. 2001. Smoking cessation counseling by primary care women physicians: Women Physicians' Health Study. *Women & Health* 32 (4):77-91.

Fetter, Robert B., Richard F. Averill, Jeffrey L. Lichtenstein, and Jean L. Freeman. 1984. Ambulatory visit groups: A framework for measuring productivity in ambulatory care. *Health Services Research* 19 (4):415-437.

Fiore, M.C., W.C. Bailey, S.J. Cohen, S. Dorfman, M. Goldstein, E. Gritz, R. Heyman, J. Hollbrook, C. Jaen, T. Kottke, H. Lando, R. Mecklenburg, P. Mullen, L. Nett, L. Robinson, M. Stitzer, A. Tommasello, L. Villejo, and M. Wewers. 2000. Treating tobacco use and dependence: Clinical practice guideline. Rockville, MD: US Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research.

Foire, M., W.C. Bailey, S.J. Cohen, S. Dorfman, M. Goldstein, E. Gritz, R. Heyman, J. Hollbrook, C. Jaen, T. Kottke, H. Lando, R. Mecklenburg, P. Mullen, L. Nett, L. Robinson, M. Stitzer, A. Tommasello, L. Villejo, and M. Wewers. 1996. Smoking cessation: Clinical Practice Guideline 18. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, US Department of Health and Human Services.

Gandjour, Afschin, and Karl Wilhelm Lauterbach. 2005. How much does it cost to change the behavior of health professionals? A mathematical model and an application to academic detailing. *Medical Decision Making* 25 (May-June):341-347.

Glynn, T. J., and M. W. Manley. 1989. How to Help Your Patients Stop Smoking. A National Cancer Institute Manual for Physicians. Bethesda, MD: Smoking, Tobacco and Cancer Program, Division of Cancer Prevention and Control, National Cancer Institute, NIH.

Goldstein, MG, JD DePue, AD Monroe, and et al. 1998. A population-based survey of physician smoking cessation counseling practices. *Preventive Medicine* 27:720-729.

Goldstein, Michael G., Raymond. Niaura, Cynthia. Willey, Alessandra. Kazura, William Rakowski, Judith DePue, and Elyse Park. 2003. An academic detailing intervention to disseminate physician-delivered smoking cessation counseling: Smoking cessation outcomes of the physicians Counseling Smokers Project. *Preventive Medicine* 36:185-196.

Greco, P.J., and J.M. Eisenberg. 1993. Changing physicians' practices. *New England Journal of Medicine* 329:1271-1274.

Hellinger, F. J. 1996. The impact of financial incentives on physician behavior in managed care plans: A review of the evidence. *Medical Care Resident Review* 53:294-314.

Hornbrook, Mark C., and et al. 2005. Building a virtual cancer research organization. *Journal of the National Cancer Institute Monographs* 35:12-25.

Hornbrook, Mark C., Arnold V. Hurtado, and Richard E. Johnson. 1985. Health are episodes: Definition, measurment and use. *Medical Care Review* 42 (2):163-218.

Katz, David A., Donna R. Muehlenbruch, Roger B. Brown, Michael C. Fiore, and Timothy B. Baker. 2002. Effectiveness of a clinic-based strategy for implementing the AHRQ smoking cessation guideline in primary care. *Preventative Medicine* 35:293-302.

Kiefe, Catarina I., Jeroan J. Allison, O. Dale Williams, Sharina D. Person, Michael T. Weaver, and Norman W. Weissman. 2001. Improving quality improvement using achievable benchmarks for physician feedback: A randomized controlled trial. *Journal of the American Medical Association* 285 (22):2871-2879.

Lamb, R. J., A. R. Morral, G. Galbicka, Kimberly C. Kirby, and M. Y. Iguchi. 2005. Shaping reduced smoking in smokers without cessation plans. *Experimental and Clincial Psychopharmacology* 13 (2):83-92.

McBride, P., M. Plane, G. Underbakke, R. Brown, and L. Solberg. 1997. Smoking screening and management in primary care practices. *Archives of Family Medicine* 6:165-172.

Meredith, Lisa, Elizabeth Yano, Scot Hickey, and Scott Sherman. 2005. Primary care provider attitudes are associated with smoking cessation counseling and referral. *Medical Care* 43 (9):929-934.

O'Brien, Thomson, A. D. Oxman, D. A. Davis, R. B. Haynes, N. Freemantle, and E. L. Harvey. *Educational outreach visits: Effects on professional practice and health care outcomes (Review)*. John Wiley & Sons, Ltd. 2005 [cited January 15, 2006.

Orleans, C. Tracy. 1993. *Treating nicotine dependence in medical settings: A stepped-care model*. Edited by C. T. Orleans and J. Slade, *Nicotine Addiction: Principles and Management*. New York: Oxford University Press.

Oxman, A. D., M. A. Thomson, D. A. Davis, and R. B. Haynes. 1995. No magic bullets: A systematic review of 102 trials of interventions to improve professional practice. *CMAJ* 153:1423-1431.

Prochaska, J. O., and C. C. DiClemente. 1992. Stages of change in the modification of problem behaviors. *Progress in Behavioral Modification* 28:183-218.

Prochaska, J.J., K. Delucchi, and S.M. Hall. 2004. A meta-analysis of smoking cessation interventions with individuals in substance abuse treatment or recovery. *Journal of Consultation and Clinical Psychology* 72 (6):1144-1156.

Rigotti, Nancy. 2002. Treatment of tobacco use and dependence. *The New England Journal of Medicine* 346 (7):506-512.

Ritzwoller, Debra P., Michael J. Goodman, Michael V. Maciosek, Jennifer Elston Lafata, Richard Meenan, Mark C. Hornbook, and Paul A. Fishman. 2005. Creating standard cost measures across integrated health care delivery systems. *Journal of the National Cancer Institute Monographs* 35:80-87.

Sippel, Jeffrey M., Molly L. Osborne, Wendy Bjornson, Bruce Goldberg, and A. Sonia Bulst. 1999. Smoking cessation in primary care clinics. *Journal of General Internal Medicine* 14:670-675.

Smith, Patrick O., Christine E. Sheffer, Thomas J. Payne, Bradford W. Applegate, and et. al. 2003. Smoking cessation research in primary care treatment centers: The SCRIPT-MS project. *American Journal of The Medical Scinece* 326 (4).

Soumerai, S.B., and J. Avorn. 1990. Principles of educational outreach ('Academic Detailing') to improve clinical decision making. *Journal of the American Medical Association* 263 (4):549-556.

Steele, MA, M. Fors, E.H. Wagner, D.D. Sims, and P. Penna. 1989. Cost effectiveness of two interventions for reducing outpatient prescribing costs. *DICP* 23 (497-500).

Stone, E. G., S. C. Morton, M. E. Hulschler, and et al. 2002. Interventions that increase use of adult immunizations and cancer screening services. *Annals of Internal Medicine* 136:641-651.

Swartz, Susan., Timothy M. Cowan, Judy. DePue, and Michael G. Goldstein. 2002. Academic profiling of tobacco-related performance measures in primary care. *Nicotine & Tobacco Research* 4.

Thompson, Robert S., Marie E. Michnich, Lindy Friedlander, Betty Gilson, Louis C. Grothaus, and Barry Storer. 1988. Effectiveness of smoking cessation interventions integrated into primary care practice. *Medical Care* 26 (1):62-76.

Wandersman, Abraham. 2003. Community science: bridging the gap between science and practice with community-centered models. *American Journal of Community Psychology* 31 (3/4):227-242.

Webb, Monica, Vani Nath Simmons, and Thomas H. Brandon. 2005. Tailored interventions for motivating smoking cessation: Using placebo tailoring to examine the influence of expectancies and personalization. *Health Psychology* 24 (2):179-188.

Weissman, Norman W., Jeroan J. Allison, Catarina I. Kiefe, and et al. 1999. Achievable benchmarks of care: The ABCs of benchmarking. *Journal of Evaluation in Clincial Practice* 5:203-215.

Wensing, M., and R. Grol. 1994. Single and combined strategies for implementing changes in primary care: A literature review. *International Journal of Quality Health Care* 6:115-132.

Yano, E. M., A. Fink, S. H. Hirsch, A. S. Robbins, and L. V. Rubinstein. 1995. Helping practices reach primary care goals: Lessons from the literature. *Archives of Internal Medicine* 155:1146-1156.