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Primary Care Provider Attitudes are Associated With Smoking Cessation Counseling and Referral

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Objective: Most primary care providers (PCPs) endorse the importance of smoking cessation, but counseling rates are low. We evaluated the consistency of PCP's attitudes toward smoking cessation counseling and corresponding smoking-cessation behaviors.

Design: This was a postintervention analysis of a population-based sample from a group randomized controlled trial to improve adherence to smoking cessation guidelines.

Setting: A total of 18 VA sites in Southwestern and Western United States participated.

Participants: A total of 280 PCPs completed a survey at 12 months after the implementation of a smoking-cessation quality improvement (QI) program. Their patients also completed 12- (n = 1080) and 18-month (n = 924) follow-up surveys.

Intervention: The quality improvement intervention included local priority setting, quality improvement plan development, implementation, and monitoring.

Measurements and Main Results: PCPs at intervention sites were more likely to report counseling patients about smoking cessation ($P = 0.04$) but not referral. PCP attitude toward smoking-cessation counseling was strongly associated with reported counseling ($P < 0.001$) and with referral ($P = 0.01$). Other associations with counseling were the perceived barrier "patients are not interested in quitting" ($P = 0.01$) and fewer years in practice ($P = 0.03$); other associations with referral were specialty consultation ($P < 0.0001$) and the perceived barrier "referral not convenient" ($P = 0.001$) (negative association). PCP attitudes were associated with higher rates of counseling, referral, and program attendance.

Conclusions: PCPs, regardless of intervention participation, had attitudes consistent with their reported smoking-cessation behaviors and more favorable attitudes were associated with higher rates of patient-reported smoking cessation behavior. Findings suggest that PCPs who endorse smoking-cessation counseling and referral may provide more treatment recommendations and have higher patient quit rates.

Key Words: primary care provider, smoking cessation, quality improvement

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Most primary care providers (PCPs) endorse the importance of smoking cessation.¹ However, counseling rates remain low¹⁻⁴ despite the availability of clinical guidelines for the treatment of tobacco dependence.^{5,6} This rate is disconcerting because tobacco use is the number one cause of preventable death in the United States⁷⁻⁹ and is associated with increased risk of heart disease, cancer, and other smoking-related illnesses. Moreover, smoking prevalence is higher among veterans than in the general population,¹⁰ making improvement in this area a high priority in Veterans Affairs (VA) settings.

One explanation for the low rates of assessment and intervention for tobacco use in primary care is that PCPs face competing demands¹¹⁻¹³ that challenge provider adherence to smoking-cessation practice guidelines. PCPs must care for multiple medical problems within a constrained time period, especially within the VA, which treats a high proportion of older patients who suffer from multiple chronic diseases. Previous research in and outside the VA has demonstrated the impact of patients' health habits and visit characteristics on the likelihood that PCPs will conduct health habit counseling (including smoking cessation).¹³ Within this context, PCPs may place a lower priority on smoking-cessation intervention practices. In fact, some studies have found strong associations between providers' attitudes toward smoking cessation and their personal smoking cessation practices,^{14,15} and that perceived barriers were bigger obstacles than were practical constraints.

Understanding the relationship between PCP attitudes about helping patients quit smoking and smoking-cessation practices may explain PCP adoption of changes associated with guideline-based smoking-cessation interventions. Previous interventions to encourage PCPs to counsel their patients who smoke to quit have shown that increasing the availability of nicotine gum or reminders placed in charts documenting smoking status, have been successful.¹⁶ In contrast, the impact of financial incentives combined with access to a centralized smoker registry were mixed.¹⁷ No studies have examined the effect of PCP attitudes about smoking-cessation treatment on smoking-cessation behavior within the context of an intervention.

The objective of this study was to assess the effect of an evidence-based quality improvement (QI) smoking cessation intervention on PCPs' reported proclivity to counsel smokers to quit, and refer smokers to a smoking-cessation program. We also assessed whether this relationship differed by intervention condition and whether PCP attitudes toward smoking-cessation counseling and practices were consistent with rates of patient-reported smoking cessation behaviors.

Our analysis was guided by the Health Belief Model,¹⁸ which was adapted for studying physician counseling practices.¹⁹ We hypothesized that intervention PCPs would have a stronger proclivity to provide smoking-cessation treatment

primarily through more favorable smoking-cessation attitudes. We also expected that more favorable attitudes would be associated with higher rates of patient-reported smoking-cessation behaviors, particularly for use of pharmacotherapy (patches and gum) given substantial evidence for its effectiveness.²⁰

Methods

Intervention

Eighteen VA medical centers (sites), matched into 9 pairs by size and academic affiliation (eg, formal relationship with a U.S. medical school/university training program), were randomized to intervention versus control conditions. Intervention sites set local priorities with top leadership, developed a local QI plan with advice from outside experts, implemented the plan and monitored its effectiveness. Control sites received copies of the 1996 Agency for Healthcare Research and Quality Smoking Cessation Guidelines.⁵

Sample and Procedure

We present data from 280 of the 466 eligible PCPs from the 18 VA sites in the Southwestern and Western United States. PCPs were sent a mail survey 12 months after implementation between October 2001 and February 2002. Three repeat mailings and an e-mail reminder yielded a 60% response rate.

To evaluate the consistency between PCP attitudes and practices with rates of smoking cessation behaviors, we linked patient survey data on smoking habits, care received, and treatment adherence with PCP survey data by site (the study design did not include a PCP to individual patient

linkage). A total of 1080 and 924 patients completed surveys at 12 and 18 months, respectively. Details about the patient sample are provided in elsewhere.²¹

Measures

We used 2 items to assess the percentage of time in a typical month PCPs spent personally counseling their patients who smoke to quit smoking and referring their patients who smoke to a VA Smoking Cessation Program. These items were rated on a 1 to 5 scale (none/0%, 25% or less, 26–50%, 51–75%, 76–100%).

Our key independent variable was PCP attitude toward providing smoking-cessation counseling. We formed a scale based on factor analysis ($\alpha = 0.65$), using 9 (of 10) 5-point Likert agreement items adapted from studies of depression treatment attitudes.^{22,23} Table 1 shows the specific items and their properties.

Multivariate models controlled for site randomization (intervention vs. control), academic affiliation, urban location (vs. small city, semi-urban, or rural, from the 1996 VHA Survey of Primary Care Delivery Models), and type of clinical setting (hospital-based outpatient clinic versus free-standing ambulatory care center). We also adjusted for PCP gender, type (physician assistant, nurse practitioner, and physician), years since completing clinical training, and frequency of consultation with smoking-cessation specialists in the past year. Other covariates included a 4-point item to assess PCP readiness to change or improve counseling and treatment of smokers (definitely, probably, maybe, or no); two 4-point items measuring PCP perceived counseling/education and referral skill (not at all skilled, slightly skilled,

TABLE 1. Attitudes Toward Smoking-Cessation Counseling: Specific Questions and Aggregate Scale*

Specific Item	Mean	SD
To what extent do you <i>agree</i> or <i>disagree</i> with the following statements?		
A. Patients are more likely to quit smoking when.	1.53	0.78
B. I am uncomfortable with counseling my smoking patients about quitting.	4.33	1.22
C. Quit rates would improve if we had more resources from our facility. [†]	2.56	1.24
D. I sometimes do not have time to counsel my smoking patients about quitting.	2.86	1.34
E. Smokers are not likely to quit when counseled.	3.74	1.11
F. My patients' acute health problems take precedence over smoking cessation counseling.	3.17	1.32
G. Most patients would quit smoking if counseled.	3.15	1.14
H. Even with more institutional resources, quit rates are not likely to improve.	3.45	1.06
I. I take time to counsel smokers about quitting at each visit.	2.04	1.10
J. Quit rates are so low that smoking cessation counseling is no longer a priority.	4.35	0.95
Attitudes toward providing smoking cessation counseling scale (9 items)	3.66	0.53

*Items were rated on a 1 to 5 scale from "Strongly Agree" to "Strongly Disagree." Scale was scored by first reversing items A, C, G, and I so that a higher score indicates stronger attitudes toward providing smoking cessation counseling and then averaging across 9 of the 10 items.

[†]Item C was dropped because of ambiguous wording and low contribution to the overall scale.

somewhat skilled, or very skilled); and seven 3-point items (does not limit, limits somewhat, or limits a great deal) eliciting perceived barriers to providing optimal smoking cessation care: (1) patient not interested in quitting, (2) medical problems more pressing, (3) preferred medications difficult to obtain, (4) counselors/educators not available, (5) referral not convenient, (6) limited visit time for counseling/education, and (7) inadequate time for follow-up.

We created 7 measures of smoking-cessation behavior based on patient reported data aggregated to the site-level (rates). These measures were based on 4 items that assessed whether the patient reported that the PCP: (1) talked to them about quitting smoking, (2) prescribed nicotine patches, (3) prescribed nicotine gum, and (4) referred them to a smoking cessation program, and 3 items that assessed whether the patient reported that they: (5) currently smoke (every day or some days vs. not at all), (6) quit smoking (for at least a day), and (7) attended a smoking-cessation program.

Analyses

We report the likelihood-based parameter estimates using multilevel analysis (SAS PROC MIXED) with PCP as the level-1 unit and site as the level-2 unit specified as random effects to account for PCPs nested within sites.²⁴⁻²⁶ We show site-level correlations to adjust for clustering of PCPs within site to evaluate associations between PCP attitudes/practices and rates of patient-reported practices.

Results

Table 2 shows PCP characteristics overall and by intervention condition. Most PCPs practiced in academic medical centers and urban areas, were men, were physicians, and had completed their clinical training 15 years previously. Intervention sites were less likely to be academic-affiliated or to be in urban areas, and had fewer physicians.

The intervention had a significant positive effect for counseling but not for referral (Table 3). Attitude was significantly associated with smoking-cessation counseling and with referral. In addition, fewer years since completing training were strongly associated with counseling proclivity as was the perceived barrier “patients are not willing to quit.” Other significant associations with referral proclivity were more specialty consultations and the perceived barrier “referral not convenient (negative association).”

Correlations between PCP smoking-cessation attitudes/practices and rates of patient-reported smoking-cessation behavior (Table 4) reveal 4 particularly robust associations significant at the site level. PCPs with more favorable attitudes toward smoking-cessation counseling had significantly higher rates of patients reporting that the PCP referred them to a smoking-cessation program (12 months). In addition, PCPs reporting a higher referral proclivity had lower rates of patients reporting they were prescribed nicotine patches (12 months), but higher rates of patient-reported referrals (12 months) and program attendance (18 months).

TABLE 2. Characteristics of Primary Care Provider (n = 280) Characteristics Overall and by Intervention Condition

Measure	n	All	Intervention	Control
Academic affiliation, %				
Academic	224	80.0	74.1*	84.2*
Nonacademic	56	20.0	25.9	15.9
Community type, %				
Urban	218	77.9	63.8*	87.8*
Semi-urban or rural	62	22.1	36.2	12.2
Facility type, %				
Medical care center	243	86.8	84.5	88.4
Ambulatory care center	37	13.2	15.5	11.6
Gender, %				
Men	216	77.1	78.5	76.2
Women	64	22.9	21.6	23.8
Provider type, %				
Physician (MD)	187	66.8	60.3*	71.3*
Physician assistant	22	7.5	13.8	3.1
Nurse practitioner	72	25.7	25.9	25.6
Years since training, mean (SD)	NA	15.3 (10.8)	15.9 (11.1)	15.0 (10.6)

*Significant differences by intervention condition at $P < 0.05$.

TABLE 3. Likelihood-Based Multi-Level Models for Smoking-Cessation Counseling and Referral Proclivity

Variable	Counseling (n = 264)			Referral (n = 254)		
	Estimate	SE	P	Estimate	SE	P
Intercept	0.81	0.72	0.28	20.14	0.68	0.01
Structural characteristics						
Intervention	-0.39	0.18	0.04	-0.27	0.19	0.19
Academic affiliation	-0.54	0.39	0.20	0.16	0.42	0.71
Urban	0.45	0.28	0.13	0.02	0.29	0.96
Medical center	0.27	0.37	0.47	-0.42	0.39	0.30
PCP Characteristics						
Female	0.16	0.19	0.40	-0.01	0.18	0.96
Physician assistant	-0.32	0.29	0.28	-0.37	0.28	0.19
Nurse practitioner	-0.19	0.20	0.33	-0.04	0.19	0.84
Years since training	-0.02	0.01	0.03	-0.01	0.01	0.15
Specialty consults	0.03	0.17	0.88	0.71	0.17	<0.0001
PCP attitudes and perceptions						
Readiness to change	-0.07	0.08	0.39	-0.10	0.08	0.22
Perceived skill	0.16	0.12	0.16	0.13	0.10	0.16
Patient not willing to quit	0.44	0.16	0.01	-0.07	0.16	0.64
Med problems pressing	-0.40	0.22	0.07	-0.33	0.21	0.11
Preferred meds difficult to get	-0.02	0.18	0.89	0.22	0.17	0.20
Counselors not available	-0.13	0.22	0.55	-0.11	0.22	0.61
Referral not convenient	-0.05	0.19	0.79	-0.58	0.18	0.001
Limited visit time for counseling	0.02	0.25	0.94	0.21	0.24	0.40
Inadequate time for follow-up	0.17	0.24	0.46	0.11	0.23	0.65
Attitude toward smoking cessation	0.77	0.15	<0.001	0.40	0.15	0.01

TABLE 4. Bivariate Associations Between PCP Attitudes and Practices With Patient-Reported Smoking-Cessation Behavior at 12 and 18 Months

PCP Measure	Time	PCP			Patient			
		Talked About Smoking	Prescribed Nicotine Patch	Prescribed Nicotine Gum	Made Referral to Program	Currently Smoke	Quit Smoking	Attended Program
Attitude toward smoking cessation counseling	12	0.39	0.01	0.07	0.65 [†]	0.14	0.11	0.27
	18	-0.04	0.18	0.07	0.26	-0.14	-0.16	0.28
Proclivity to counsel to quit smoking	12	0.11	-0.36	-0.15	0.16	-0.09	0.07	-0.21
	18	0.23	-0.07	0.10	0.28	-0.05	0.01	0.11
Proclivity to refer to a VA smoking cessation program	12	-0.11	-0.44*	0.14	0.43*	-0.05	0.07	0.02
	18	-0.38	-0.41	0.02	0.19	-0.37	0.04	0.46*

**P* < 0.10; [†]*P* < 0.01.

Discussion

We found that an evidence-based QI intervention to encourage smoking-cessation counseling and pharmacotherapy by PCPs was effective in strengthening the reported proclivity to counsel patients about their smoking but not to refer patients who smoke to VA Smoking Cessation Pro-

grams. PCP attitudes also were associated with higher rates of patient-reported smoking-cessation behaviors. The finding of attitude-behavior consistency with regard to smoking cessation treatment suggests that changing provider attitudes can improve adherence with smoking cessation guidelines to help patients quit smoking.

Effective provider education programs, although insufficient alone,^{27,28} could improve treatment knowledge over time²³ and lead to more favorable attitudes and behavior change. In fact, successful collaborative care models^{29,30} and other multifaceted QI programs^{31–33} retain provider education as a core element. Education programs that incorporate strategies for overcoming perceived (and actual) barriers to delivering smoking-cessation treatments may be even more effective particularly within the competing demands they face in everyday practice.¹ However, previous studies have not examined how these barriers affect treatment proclivity and quit rates.¹³ Regarding barriers, we found that perceptions that patients are not willing to quit were associated with a lower counseling proclivity and perceptions that referral is not convenient was associated with less referral. Although nearly all VA sites have smoking-cessation medications on formulary, most do not allow PCPs to prescribe these medications because their use is restricted to patients attending a smoking-cessation program.³⁴ Educational interventions and system changes aimed at making referral more convenient would likely help PCPs overcome these perceived barriers and encourage more referral.

Our study was unable to evaluate the incremental effect of the QI intervention over time because we did not have data of sufficient quality on PCPs before the smoking-cessation intervention was implemented. In fact, although preliminary data were collected from some PCPs, the response rate was dismal (only 32% overall and only 49% overlap with the postintervention sample). Therefore, we must rely on intervention versus control differences postimplementation. We do have limited evidence however from the small baseline sample that readiness to change did not differ between intervention and control. This minimizes the potential for preintervention nonequivalence across groups to bias postintervention findings.

VA providers may not represent the attitudes and behaviors of providers who work in other types of medical settings. However, Meredith et al²² has shown that for mental health services, VA systems of care share many characteristics of delivery system design as do large group- or staff-model managed care organizations (MCOs), including greater integration with behavioral health services. We would expect such large integrated MCOs to be similarly integrated for preventive care services, such as smoking cessation. Further, our data represent only 60% of the eligible PCPs at the study sites, and we were restricted from collecting any identifying information on individual providers by the local VA institutional review boards. We were able to examine differences in nonresponse to the survey by site. Although nonresponse ranged from 46% to 86%, most of the variation was because of smaller sites with few providers having higher rates and academic sites with less committed residents in training having lower rates. However, we did match sites on these factors and also

included them in our multivariate models, which in part accounted for these sources of bias.

Social desirability bias might also limit the study if providers at the intervention sites responded more favorably to please their site contact or the study team. We believe this type of bias is unlikely since most of the site contacts were from mental health departments and did not interact with the PCPs on a regular basis.

Although we could not evaluate the association between what PCPs tell us they do and what patients tell us happened at the patient level, our aggregated analyses suggest that providers and sites with higher rates of PCP smoking-cessation counseling and referral may influence PCP treatment recommendations and quit rates. Additional research should look more closely at this linkage with higher-powered analysis of individual patients including an examination of whether patient and system barriers may explain continued low rates of smoking cessation counseling by PCPs.³⁵

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REFERENCES

1. Block DE, Hutton KH, Johnson KM. Differences in tobacco assessment and intervention practices: a regional snapshot. *Prev Med.* 2000;30:282–287.
2. Cohen SJ, Christen AG, Katz BP, et al. Counseling medical and dental patients about cigarette smoking: the impact of nicotine gum and chart reminders. *Am J Public Health.* 1987;77:313–316.
3. Cummings KM, Giovino G, Sciandra R, et al. Physician advice to quit smoking: who gets it and who doesn't. *Am J Prev Med.* 1987;3:69–75.
4. Wells KB, Lewis CE, Leake B, et al. The practices of general and subspecialty internists in counseling about smoking and exercise. *Am J Public Health.* 1986;76:1009–1013.
5. Agency for Healthcare Research. *Smoking Cessation. Clinical Practice Guideline No. 18, Publication No. 96-0692.* Rockville, MD: AHCPR; 1996.
6. The Tobacco Use and Dependence Clinical Practice Guideline Panel. A clinical practice guideline for treating tobacco use and dependence: a US Public Health Service report. *JAMA.* 2000;283:3244–3254.
7. U.S. Health and Human Services. *Tobacco Use Among U.S. Racial/Ethnic Minority Groups: African Americans, American Indians and Alaska Native, Asian Americans and Pacific Islanders, and Hispanics: A Report of the Surgeon General.* Atlanta, GA: Centers for Disease Control and Prevention; 1998.
8. Centers for Disease Control and Prevention. Cigarette smoking among adults—United States, 2003. Tobacco information and prevention source (TIPS). *Department of Health and Human Services.* Available at: www.cdc.gov/tobacco/research_data/adults_prev/mm5420_highlights.htm. Accessed May 27, 2005.
9. Centers for Disease Control and Prevention. Adult cigarette smoking in the United States: Current estimates. Tobacco information and preven-

- tion source (TIPS). *Department of Health and Human Services*. Available at: www.cdc.gov/tobacco/factsheets/AdultCigaretteSmoking_FactSheet.htm. Accessed June 20, 2005.
10. Miller DR, Kalman D, Ren XS. *Health Behaviors of Veterans in the VHA: Tobacco use. 1999 Large Health Survey of VHA Enrollees*. Washington, DC: Department of Veteran Affairs, Veterans Health Administration; 2001.
 11. Klinkman MS. Competing demands in psychosocial care: a model for identification and treatment of depressive disorders in primary care. *Gen Hosp Psychiatry*. 1997;19:98–111.
 12. Nutting PA, Rost K, Smith J, et al. Competing demands from physical problems: effect on initiating and completing depression care over 6 months. *Arch Fam Med*. 2000;9:1059–1064.
 13. Chernof BA, Sherman SE, Lanto AB, et al. Health habit counseling amidst competing demands: effects of patient health habits and visit characteristics. *Med Care*. 1999;37:738–747.
 14. Orleans CT, George LK, Houghton JL, et al. Health promotion in primary care: a survey of U.S. family practitioners. *Prev Med*. 1985;14:636–647.
 15. Kviz FJ, Clark MA, Prohaska TR. Attitudes and practices for smoking cessation counseling by provider type and patient age. *Prev Med*. 1995;24:201–212.
 16. Cohen SJ, Stookey GK, Katz BP, et al. Helping smokers quit: a randomized controlled trial with private practice dentists. *J Am Dent Assoc*. 1989;118:41–45.
 17. Roski J, Jeddelloh R, An L, et al. The impact of financial incentives and a patient registry on preventive care quality: increasing provider adherence to evidence-based smoking cessation practice guidelines. *Prev Med*. 2003;36:291–299.
 18. Becker MH, Maiman LA. Sociobehavioral determinants of compliance with health and medical care recommendations. *Med Care*. 1975;13:10–24.
 19. Wells KB, Ware JE Jr, Lewis CE. Physicians' practices in counseling patients about health habits. *Med Care*. 1984;22:240–246.
 20. Fiore MC. US public health service clinical practice guideline: treating tobacco use and dependence. *Respir Care*. 2000;45:1200–1262.
 21. Sherman SE, Lanto AB, Yano EM. Smoking cessation care received by veterans with chronic obstructive pulmonary disease. *J Rehab Res Devel*. 2003;40(Suppl 2):1–12.
 22. Meredith LS, Rubenstein LV, Rost KM, et al. Treating depression in staff-model vs network-model managed care organizations. *J Gen Intern Med*. 1999;14:39–48.
 23. Meredith LS, Jackson-Triche M, Duan N, et al. Quality improvement for depression enhances long-term treatment knowledge for primary care clinicians. *J Gen Intern Med*. 2000;15(12):868–877.
 24. Bryk AS, Raudenbush SW. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, CA: Sage Publications; 1992.
 25. Kreft GG, De Leeuw J. *Introducing Multilevel Modeling*. In: *Introducing Statistical Methods*. London, Thousand Oaks, CA: Sage; 1998.
 26. Goldstein H. *Multilevel Statistical Models*. 2nd ed. New York: Halstead Press; 1995.
 27. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. *JAMA*. 1995;274:700–705.
 28. Oxman AD, Thomson MA, Davis DA, Haynes RB. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. *Can Med Assoc J*. 1995;153:1423–1431.
 29. Katon W, Von Korff M, Lin E, et al. Collaborative management to achieve treatment guidelines. Impact on depression in primary care. *JAMA*. 1995;273:1026–1031.
 30. Katon W, Robinson P, Von Korff M, et al. A multifaceted intervention to improve treatment of depression in primary care. *Arch Gen Psychiatry*. 1996;53:924–932.
 31. Wells KB, Sherbourne CD, Schoenbaum M, et al. Impact of disseminating quality improvement programs for depression in managed primary care: a randomized controlled trial. *JAMA*. 2000;283:212–220.
 32. Wagner EH, Austin BT, Von Korff M. Improving outcomes in chronic illness. In: Fama T, Fox PD, eds. *Managed Care and Chronic Illness: Challenges and Opportunities*. Gaithersburg, MD: Aspen Publishers; 1996.
 33. Wagner EH, Glasgow RE, Davis C, et al. Quality improvement in chronic illness care: a collaborative approach. *Jt Comm J Qual Improv*. 2001;27:63–80.
 34. Mittman BS, Yano EM, Sherman SE. *Measurement of the structure and process of smoking cessation care: QUITs Ambulatory Care/Primary Care Manager Questionnaire (Part 1)(Technical Report #CPQ-97-002-004)*. Sepulveda, CA: VA Greater Los Angeles HSR&D Center of Excellence; 2003.
 35. Thorndike AN, Rigotti NA, Stafford RS, et al. National patterns in the treatment of smokers by physicians. *JAMA*. 1998;279:604–608.