Disparities in receipt of 5As for smoking cessation in diverse primary care and HIV clinics

Maya Vijayaraghavan [a,*], Patrick Yuan [b], Steven Gregorich [b], Paula Lum [c], Nicole Appelle [b], Anna Maria Napoles [b], Sara Kalkhoran [d], Jason Satterfield [b]

[a] Division of General Internal Medicine/Zuckerberg San Francisco General Hospital, University of California, San Francisco, United States
[b] Division of General Internal Medicine, Department of Medicine, University of California, San Francisco, United States
[c] Division of HIV/AIDS, Department of Medicine, University of California, San Francisco, United States
[d] Division of General Internal Medicine, Department of Medicine, Massachusetts General Hospital, United States

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ABSTRACT

Clinical practice guidelines recommend that clinicians implement the 5As (Ask, Advise, Assess, Assist, and Arrange) for smoking cessation at every clinical encounter. We sought to examine the prevalence of patient- and clinician-reported 5As in two primary care and one HIV care clinics in San Francisco, California between August 2013 and March 2014 ($n = 462$ patients and $n = 61$ clinicians). We used multivariable logistic regression analysis to identify factors associated with receipt of the 5As, adjusting for patient demographics, patient insurance, clinic site, patient tobacco use, and patient comorbidities. The patient-reported prevalence of 5As receipt was as follows: Ask, 49.9%; Advise, 47.2%; Assess, 40.6%; any Assist, 44.9%; and Arrange, 22.4%. In multivariable analysis, receipt of Advise, Assess, and Assist were associated with older patient age. Whereas patients with HIV had a lower odds of reporting being advised (AOR 0.5, 95% CI 0.3–0.8) or assessed for readiness to quit (AOR 0.6, 95% CI 0.4–0.9), patients with pulmonary diseases had higher odds of reporting being assisted (AOR 1.6, 95% 1.0–2.6) than patients without these diagnoses. Although the majority of clinicians reported asking (91.8%), advising (91.8%), and assessing (93.4%) tobacco use 'most of the time' or 'always' during a clinical encounter, fewer reported assisting (65.7%) or arranging (19.7%) follow-up. Only half of patients reported being screened for tobacco use and fewer reported receipt of the other 5As, with significant disparities in receipt of the 5As among patients with HIV. Our findings confirm the need for interventions to increase clinician-delivered cessation treatment in primary and HIV care.

1. Introduction

Tobacco use is the leading preventable cause of death, and is responsible for >480,000 deaths annually in the United States (U.S.) (U.S. Department of Health and Human Services, 2014). The major causes of excess mortality among smokers stem from smoking-related cancers, cardiovascular disease and respiratory disease (Centers for Disease Control and Prevention, 2008a; Jha et al., 2013). Although the past 4 decades have seen significant declines in the prevalence of smoking in the general population, prevalence remains high among certain populations (Prevention CfDCa, 2014; Jamal et al., 2015). Low-income persons (Prevention CfDCa, 2014; Jamal et al., 2015), racial/ethnic minorities (Jamal et al., 2015; Centers for Disease Control and Prevention, 2005), persons with mental health disorders or substance use disorders

(Schroeder and Morris, 2010), indigent persons living with HIV/AIDS (Vijayaraghavan et al., 2014), and persons who are uninsured or publicly insured (Centers for Disease Control and Prevention, n.d.), bear a disproportionate burden of tobacco-related morbidity and mortality (Centers for Disease Control and Prevention, 2008b).

Primary care clinicians are in a unique position to help patients quit smoking by employing strategies outlined in the U.S. Public Health Service guidelines (Fiore et al., 2008). These guidelines recommend that all clinicians offer brief interventions for smoking cessation at all or nearly all encounters using the 5As (Ask about smoking, Advise cessation, Assess readiness to quit, Assist with motivation and/or cessation, and Arrange follow-up) (Fiore et al., 2008) Most smokers in the general population are interested in quitting smoking and almost half attempt to quit smoking yearly (Centers for Disease Control and Prevention, 2011). Smokers are receptive to counseling for smoking cessation (Fiore et al., 2008), and about half report having received advice to quit from a health professional (Centers for Disease Control and Prevention, 2011; Kruger et al., 2012). Most smokers cite clinician's advice to quit smoking as an important motivator for smoking cessation

* Corresponding author at: University of California, San Francisco, Division of General Internal Medicine/San Francisco General Hospital, UCSF Box 1364, 1001 Potrero Avenue, United States.
E-mail address: Maya.Vijayaraghavan@ucsf.edu (M. Vijayaraghavan).

(Kruger et al., 2012; Gilpin et al., 1993). Receipt of clinician-delivered counseling, in particular the more intensive Assist and Arrange interventions for smoking cessation has been shown to increase cessation (Fiore et al., 2008; Park et al., 2015). Receipt of all the 5As compared to one or none during a clinical encounter has been associated with increased use of cessation services (Kruger et al., 2016).

Despite patients' interest in receiving counseling, there is significant variability in clinician delivery of the 5As (Park et al., 2015; Ferketich et al., 2006; Thorndike et al., 2007). Previous research has shown that while most smokers are screened for tobacco use, fewer are advised to quit or assessed for their readiness to quit, and only a minority report receipt of clinician-delivered Assist (pharmacotherapy and/or more intensive counseling) or Arrange (Park et al., 2015; Ferketich et al., 2006; Jamal et al., 2012). Fewer than 25% of Medicaid-enrolled smokers reported receiving assistance with cessation (Chase et al., 2007). Racial/ethnic minorities, persons of lower socioeconomic status, and younger persons are less likely to receive clinician-delivered cessation interventions (Danesh et al., 2014; Browning et al., 2008; Ferketich et al., 2014). Patient comorbidity and time spent with the physician are also associated with lower probability of receiving smoking cessation interventions in clinical care (Jamal et al., 2015; Ferketich et al., 2006; Silfen et al., 2015).

In this study, we examined the prevalence of receipt of clinician-delivered 5As among patients in two diverse primary care clinics and

Table 1
Patient demographics and tobacco use characteristics.

	Total N = 462 Mean (SD) or N (%)	Site 1 N = 77 Mean (SD) or N (%)	Site 2 N = 109 Mean (SD) or N (%)	Site 3 N = 276 Mean (SD) or N (%)	P-value
Age	50.8 (11.2)	54.8 (10.3)	52.8 (13.3)	48.8 (10.1)	<0.001
Sex					
Female	142 (30.7)	33 (42.9)	56 (51.4)	53 (19.2)	<0.001
Male	311 (67.3)	44 (57.1)	53 (48.6)	214 (77.5)	
Transgender/other	9 (1.95)	0 (0.0)	0 (0.0)	9 (3.3)	
Race/ethnicity					
White	142 (30.7)	16 (20.8)	36 (33.0)	90 (32.6)	<0.003
African American	195 (42.2)	43 (55.8)	44 (40.4)	108 (39.1)	
Hispanic/Latino	84 (18.2)	12 (15.6)	15 (13.8)	57 (20.7)	
Asian	10 (2.2)	3 (3.9)	2 (1.8)	5 (1.8)	
Native Hawaiian/PI	2 (0.4)	0 (0.0)	1 (0.9)	1 (0.4)	
American Indian/Alaskan native	12 (2.6)	0 (0.0)	1 (0.9)	11 (3.9)	
Other/Mixed	17 (3.7)	3 (3.9)	10 (9.2)	4 (1.5)	
Education					<0.03
Less than high school	88 (19.1)	17 (22.1)	11 (10.1)	60 (21.7)	
High school or GED	141 (30.5)	22 (28.6)	28 (25.7)	91 (32.9)	
Some college	177 (38.3)	31 (40.3)	52 (47.7)	94 (34.1)	
College degree or more	56 (12.1)	7 (9.1)	18 (16.5)	31 (11.2)	
Health insurance					<0.001
None	12 (2.6)	5 (6.5)	0 (0.0)	7 (2.5)	
HMO/PPO	34 (7.4)	3 (3.9)	27 (24.8)	4 (1.5)	
Healthy San Francisco/healthy workers[a]	76 (16.5)	20 (25.9)	6 (5.6)	50 (18.1)	
Medi-Cal	52 (11.3)	12 (15.6)	10 (9.2)	30 (10.9)	
MediCal/MediCare	249 (53.9)	27 (35.1)	51 (46.8)	171 (61.9)	
Other	19 (4.1)	5 (6.5)	2 (1.8)	12 (4.4)	
Type of visit					0.9
Urgent care	82 (17.7)	13 (16.9)	19 (17.4)	50 (18.1)	
Primary care	380 (82.3)	64 (83.1)	90 (82.6)	226 (81.9)	
Clinics[b]					
Site 1	77 (16.7)	--	--	--	
Site 2	109 (23.6)	--	--	--	
Site 3	276 (59.7)	--	--	--	
Smoking status[c]					<0.02
Current daily	365 (79.4)	63 (81.8)	76 (69.7)	226 (82.5)	
Current non-daily	95 (20.7)	14 (18.2)	33 (30.3)	48 (17.5)	
Average daily cigarette consumption[c]	10 (8.4)	10.1 (8.3)	9.0 (7.6)	10.4 (8.7)	0.9
Time to first cigarette after waking[c]					0.3
30 min or less	280 (60.9)	46 (59.7)	60 (55.1)	174 (63.5)	
≥30 min	180 (39.1)	31 (40.3)	49 (44.9)	100 (36.5)	
Comorbidities					
HIV	270 (58.4)	5 (6.5)	0 (0.0)	265 (96.0)	<0.001
Cancer	74 (16.0)	9 (11.7)	17 (5.6)	48 (17.4)	0.5
Mental health disorders[d]	369 (79.9)	57 (74.0)	87 (79.8)	225 (81.5)	0.3
Alcohol dependence	78 (16.9)	23 (29.9)	8 (7.3)	47 (17.0)	<0.001
Drug dependence	407 (88.1)	71 (92.2)	93 (85.3)	243 (88.0)	0.4
Cerebrovascular disease	43 (9.3)	13 (16.9)	10 (9.2)	20 (7.3)	<0.04
Pulmonary disease	101 (21.9)	45 (58.4)	55 (50.5)	1 (0.4)	<0.001
Cardiovascular disease[d]	287 (62.1)	67 (87.0)	72 (66.1)	148 (53.6)	<0.001
Glaucoma	29 (6.3)	4 (5.2)	12 (11.0)	13 (4.7)	0.07

– Not applicable.

[a] Healthy San Francisco is a program designed to make health care services available to uninsured San Francisco residents. Healthy Workers is a health insurance program administered by San Francisco Health Plan.

[b] Site 1 is an academic general internal medicine practice in a University-Affiliated public hospital, Site 2 is an academic general internal medicine practice in a University-affiliated hospital, Site 3 is an HIV practice in a University-affiliated public hospital.

[c] Data on cigarette smoking missing for 2 people.

[d] Mental health disorders include Anxiety, Somatoform, dissociative disorder, bipolar disorder, schizophrenia, post traumatic stress disorder, and depression. Cardiovascular disease includes hypertension.

one HIV care clinic and patient-related factors associated with receipt of the 5As. Consistent with previous studies (Park et al., 2015; Ferketich et al., 2006; Jamal et al., 2012), we hypothesized that receipt of Ask, Advise, and Assess would be higher than Assist and Arrange. We hypothesized that receipt of 5As would vary by clinic because of the distribution of patient comorbidity, and that patients with HIV/AIDS and those with mental health disorders or substance use disorders would be less likely to receive 5As. Among a subgroup of patients and their clinicians, we examined the indirect association between patient-reported receipt of 5As and clinician-reported overall adherence to 5As during their clinical practice.

2. Methods

2.1. Study patients and sampling

This study includes the analysis of cross-sectional data from the pre-implementation evaluation of patients and clinicians who were enrolled in a larger study of a randomized controlled trial of a computer tablet intervention to increase clinician adherence to 5As (Kalkhoran et al., 2016). We recruited patients and clinicians from 3 diverse clinics: an academic general internal medicine practice in a University-affiliated public hospital ("site 1"), an academic general internal medicine practice at a University-affiliated hospital ("site 2"), and an academic HIV practice

at a University-affiliated public hospital ("site 3") (Kalkhoran et al., 2016). Data were collected between August 2013 and March 2014.

We recruited current smokers (i.e. having smoked at least 100 cigarettes in their lifetime and having smoked at least 1 cigarette in the past 7 days) who were 18 years or older, Spanish- or English-speaking, and engaged in primary or urgent care in any of the 3 clinics. We recruited clinicians, including post-graduate trainees, who were in internal medicine or family medicine specialties, engaged in patient care in one of the three clinic sites, and planned to continue to work in their current location for at least 1 year. All study protocols were approved by the University of California San Francisco, Committee on Human Research.

2.2. Study procedures

Trained research staff approached patients in clinic waiting rooms prior to their primary care or urgent care clinic visits (i.e. the index clinic visit). Research staff screened patients for eligibility, enrolled patients into the study, and obtained written informed consent. Research staff administered a brief demographic questionnaire prior to the index visit, and a post-visit questionnaire (either in person or by telephone) on tobacco use behaviors and receipt of the 5As within 72 h of their visit. We were unable to complete all of the follow-up assessments by phone because some patients lacked functioning telephones. If the patient was unsure that he or she could be contacted by telephone, we
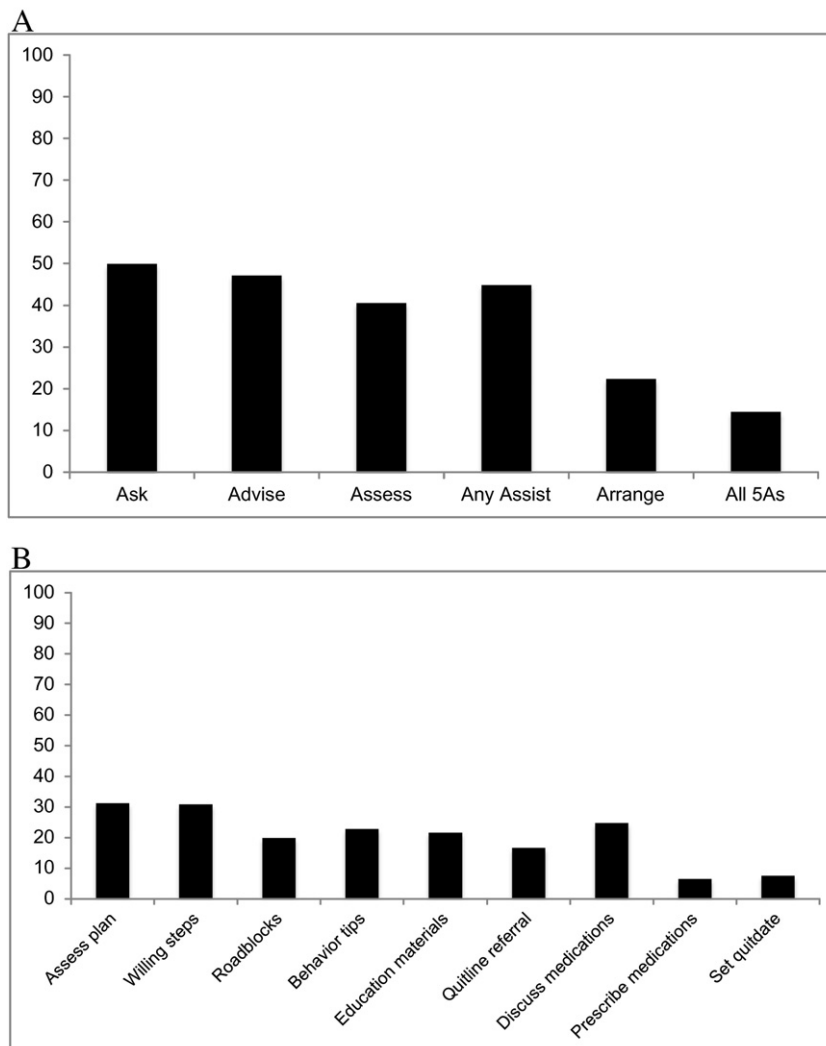

Fig. 1. A: Proportion of patients who self-reported receipt of 5As (*N* = 462) B: Proportion of patients who self-reported receipt of components of Assist (*N* = 462).

completed the follow-up assessment in person. Patients received a $20 gift card for completing the pre- and post-visit questionnaires.

We recruited and consented clinicians by email, and asked them to complete a self-administered online questionnaire about demographics, tobacco use behaviors, and adherence to 5As counseling. Clinician assessments took place at a different time, and were unrelated to the patients' index visits. We gave clinicians a $25 gift card for completing the questionnaire.

2.3. Study measures

2.3.1. Patients

Prior to the index visit, patients self-reported information on: demographics (age and sex); race/ethnicity (Hispanic/Latino, White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaskan Native, Other/Mixed); and education (less than high school, high school or general education development, some college, or college degree or more). Patients self-reported whether they had health insurance, and if they did, they reported the type (Medicare, Medi-Cal or Medicaid, HMO or PPO, Healthy San Francisco or Healthy Worker, Other). Research staff confirmed with clinic staff whether patients were seeking primary or urgent care on the day of the visit. We estimated average daily cigarette consumption from patient self-reports of the number of days smoked and the number of cigarettes smoked per day. We obtained information on time to first cigarette after waking, and dichotomized responses as <30 min and ≥30 min.

After the index visit, we asked patients to self-report receipt of the 5As during that visit. We asked patients whether their clinician had asked about their smoking, advised them to quit smoking, assessed their readiness to quit smoking, assisted them in building motivation and/or their smoking cessation attempt, and arranged for follow-up. Patients self-reported whether they had received each of the Assist components, as defined in the clinical practice guidelines (Fiore et al., 2008), including: planning to set a quit date, willingness to take steps

to get ready to stop smoking, addressing roadblocks to quitting smoking, obtaining tips to cope with cigarette cravings, receiving patient education about quitting smoking, receiving information on outside resources for cessation (e.g. telephone quit line), obtaining information on smoking cessation medications, receiving a prescription for a cessation medication, and setting a quit date at that visit.

We extracted data on patient comorbidities from the clinical records using ICD-9 codes. We focused on the following comorbidities that may be associated with receipt of 5As: HIV (V08, 042.x–044.x), mental health disorders (300.x, 296.x, 295.x, 309.81, 311.x), drug dependence (304.x, 305.x), alcohol dependence (393.x), cancer (140.x–172.x, 174.x–195.8, 200.x–208.x, 238.6), pulmonary disease (490.x–505.x, 506.5, 416.7, 416.9, 508.1, 508.8), cerebrovascular disease (430.x–438.x, 362.34), cardiovascular disease (401.x–405.x, 410.x–414.x, 440.x, 444.x), and glaucoma (365.x).

2.3.2. Clinicians

Clinicians self-reported information on demographics (age and sex) and race/ethnicity (Hispanic/Latino, Black or African American, Asian or Pacific Islander, White, Native American or Alaskan Native, Other/Mixed). We obtained information on clinicians' primary practice location, primary degree, number of years in clinical practice (0–2 years, 2–5 years, 5–10 years, 10–20 years, >20 years), and the time that they spent in direct patient care (0%–40%, 41%–80%, 81%–100%). Clinicians self-reported whether they had ever smoked at least 100 cigarettes in their lifetime. Ever smokers self-reported whether they were current smokers. We asked clinicians how frequently they adhered to the 5As [Ask, Advise, Assess, Assist (encourage to set a quit date, discuss medications, or refer to smoking cessation treatment) (Fiore et al., 2008), and Arrange] overall in their outpatient practice using the following response options: "Never", "Rarely", "Some of the time", "Most of the time", or "Always". Clinicians also reported whether they had heard about the 5As, whether they had received training to administer the 5As, whether they would be interested in more 5As training, and the proportion of their patients who were smokers.

Table 2

Multivariable logistic regression analysis with backward elimination of patient-related factors associated with receipt of 5As (N = 462).

	Ask Adjusted odds ratio (95% CI)[a]	Advise Adjusted odds ratio (95% CI)[a]	Assess Adjusted odds ratio (95% CI)[a]	Assist Adjusted odds ratio (95% CI)[a]	Arrange Adjusted odds ratio (95% CI)[a]	All 5As Adjusted odds ratio (95% CI)[a]
Age[b]	1.1 (0.9–1.2)	1.1 (1.0–1.2)[‖]	1.1 (1.0–1.2)[‖]	1.1 (1.0–1.2)[¶]	--[c]	--[c]
Sex						
Male	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Female	1.3 (0.9–1.8)	1.4 (1.0–1.9)	--[c]	--[c]	--[c]	--[c]
Race/ethnicity						
Nonwhite	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
White	--[c]	0.7 (0.5–1.1)	0.7 (0.4–1.1)	--[c]	--[c]	0.6 (0.3–1.2)
Clinics[d]						
Site 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Site 2	0.7 (0.4–1.2)	--[c]	--[c]	--[c]	--[c]	--[c]
Site 3	0.3 (0.2–0.6)[#]	--[c]	--[c]	--[c]	--[c]	--[c]
Average daily cigarette consumption	1.0 (0.9–1.0)	1.0 (1.0–1.04)	--[c]	--[c]	--[c]	1.0 (1.0–1.1)[‖]
Comorbidities						
HIV	--[c]	0.5 (0.3–0.8)[¶]	0.6 (0.4–0.9)[‖]	--[c]	--[c]	--[c]
Mental health disorders	0.7 (0.4–1.1)	--[c]	0.7 (0.4–1.1)	0.7 (0.5–1.1)	0.7 (0.4–1.1)	--[c]
Drug dependence	--[c]	--[c]	1.5 (0.9–2.6)	--[c]	--[c]	--[c]
Pulmonary disease	--[c]	--[c]	--[c]	1.8 (1.1–2.8)[‖]	1.4 (0.9–2.3)	1.5 (0.8–2.9)
Cardiovascular disease	--[c]	--[c]	--[c]	--[c]	2.2 (1.3–3.8)[¶]	1.9 (1.1–3.5)[‖]
Glaucoma	--[c]	--[c]	--[c]	--[c]	--[c]	0.3 (0.1–1.7)

[a] P-values were obtained from logistic regression analysis, accounting for clustering by provider.
[b] The odds ratio represents the odds of receiving counseling for every 5-unit increase in age.
[c] Variables were omitted from the model if p > 0.2.
[d] Site 1 is an academic general internal medicine practice in a University-Affiliated public hospital, Site 2 is an academic general internal medicine practice in a University-affiliated hospital, Site 3 is an HIV practice in a University-affiliated public hospital.
[¶] p < 0.005.
[#] p < 0.001.
[‖] p < 0.05.

2.4. Statistical analysis

We reported sample characteristics for patients and clinicians using means (SD) for continuous variables and proportions for categorical variables. We reported the patient-reported receipt of each of the 5As. We examined the bivariate association of receipt of the 5As and patient demographics, clinic site, and tobacco use characteristics using logistic regression analysis accounting for clustering of patients within providers. We conducted logistic regression analyses with a backward elimination algorithm, adjusting for patient demographics, visit type, insurance status, clinic site, tobacco use characteristics, and patient co-morbidities. Covariates with a *p*-value of 0.2 or lower were retained.

We examined adherence to the 5As among clinicians, and categorized responses as "Never", "Rarely or Sometimes", or "Most of the time or Always". We examined the bivariate association of clinician adherence to the 5As by clinician demographics, clinic site, and clinical practice characteristics using the chi-square statistic for categorical variables and the *t*-test for continuous variables. For the sub-sample of patients who had a study clinic visit with one of the participating clinicians, we fit logistic regression models to examine the indirect association between patient-reported receipt of the specific 5As components and clinician adherence to the same components. We did this to obtain a global assessment, as opposed to a visit-specific assessment, of the communication between patients and clinicians around the 5As for smoking cessation. Models for each component of the 5As were adjusted for patient demographics, visit type, insurance status, clinic site, tobacco use characteristics, and clinician report of the corresponding 5As. All analyses were conducted using Stata, version 11.

3. Results

3.1. Patient-reported receipt of the 5As

We recruited 493 patients, of whom 462 (93.7% response rate) patients completed the pre- and post-index visit questionnaires. The analytic sample included 462 patients, with 16.7% were enrolled in site 1, 23.6% were enrolled in site 2, and 59.7% were enrolled in site 3 (Table 1). Average age was 50.8 years (SD 11.2), 67.3% were male, and 42.2% were African American. The majority (79.4%) were current daily smokers and nearly two-thirds (60.9%) smoked within 30 min of waking. The majority of patients had at least one mental health disorder (79.9%) or a drug dependence disorder (88.1%).

Sites 1 and 3 served predominantly underserved populations. Patients in site 1 (55.8%) had a higher proportion of African American patients compared to site 2 (40.4%) and site 3 (39.1%) (*p* < 0.003) (Table 1). Patients in site 1 were more likely to be older (54.8 years) compared to site 2 (52.6 years) and site 3 (48.7 years) (*p* < 0.001). Patients in site 1 (27.8%) were more likely to report receiving medical coverage through the Healthy San Francisco program for uninsured patients compared to patients in site 2 (5.5%) and site 3 (18.6%) (*p* < 0.001). Patients in site 1 had more comorbidities than patients in the other 2 sites.

The patient-reported prevalence of 5As receipt during their index visit was as follows: 49.9% Ask; 47.2% Advise; 40.6% Assess; 44.9% any Assist; 22.4% Arrange, and 14.5% for all 5As (Fig. 1A). The least frequently reported types of Assist included receiving prescriptions for smoking cessation (6.5%) and assistance with setting a quit date (7.6%; Fig. 1B).

In bivariate analyses, older patient age was associated with increased receipt of 5As (Supplementary Tables 1 and 2). Patients in site 3 were less likely to report having received Ask, Advise, Assess, or any Assist components of 5As compared to patients in site 1. In multivariable models, older patient age was associated with higher odds of receipt of Advise, Assess, and Assist interventions (Table 2). Patients in site 3 had a lower likelihood of being asked about tobacco use (AOR 0.3, 95% CI 0.2–0.6) than those in site 1 (Table 3). Patients with HIV had a lower likelihood of being advised (AOR 0.5, 95% CI 0.3–0.8) or assessed (AOR 0.6, 95% CI 0.4–0.9) than those without. Patients with

pulmonary disease had a higher likelihood of being assisted (AOR 1.8, 95% CI 1.1–2.8) and patients with cardiovascular disease had a higher likelihood of having follow-up arranged (AOR 2.2, 95% CI 1.3–3.8) than patients without these diagnoses (Table 3). Patients with cardiovascular disease had a higher likelihood of reporting receipt of all the 5As during the index visit (AOR 1.9, 95% CI 1.1–3.5).

3.2. Clinician-reported adherence to the 5As

Of the 61 clinicians, 39.3% reported working in site 1, 42.6% reported working in site 2, and 18.0% reported working in site 3 (Table 3). The majority of clinicians were physicians (88.5%). Of the clinicians, 11.5% reported being ever smokers; none of them currently smoked. Almost all (90.2%) had heard of the 5As, 72.1% had received training for 5As, and 80.3% reported being interested in receiving more training to implement the 5As.

Almost all clinicians reported that during clinical encounters they had asked their patients about smoking (91.8%), advised them to quit smoking (91.8%), and assessed their readiness to quit (93.4%) "most of the time" or "always" (Fig. 2A). About two-thirds (65.7%) reported assisting patients with a quit attempt, a minority (19.7%) reported arranging for a follow-up, and a minority (18.0%) reported adhering to all the 5As either "most of the time" or "always" during clinical

Table 3
Provider sample characteristics.

	Total N = 61 Mean (SD) or N (%)
Age	38.9 (10.6)
Sex	
Female	44 (72.1)
Male	17 (27.9)
Race/ethnicity	
White	39 (63.9)
African American	1 (1.6)
Hispanic/Latino	6 (9.8)
Asian	12 (19.7)
Native Hawaiian/PI	0 (0.0)
American Indian/Alaskan native	0 (0.0)
Other/mixed	3 (4.9)
Education	
Physician	54 (88.5)
Nurse practitioner	7 (11.5)
Years in practice	
0–2 years	21 (34.4)
2–5 years	8 (13.1)
5–10 years	7 (11.5)
10–20 years	19 (31.2)
>20 years	6 (9.8)
Percentage of time spent in patient care	
0%–40%	22 (36.1)
41%–80%	17 (27.9)
81%–100%	22 (36.1)
Clinics[a]	
Site 1	24 (39.3)
Site 2	26 (42.6)
Site 3	11 (18.0)
Smoking status	
Ever smoker	7 (11.5)
Current smoker	0 (0.0)
Heard of 5As	55 (90.2)
Received training for 5As	44 (72.1)
Interested in more 5As training	49 (80.3)
Proportion of patients who smoke	
0%–24%	24 (39.3)
25%–49%	34 (55.7)
50%–74%	2 (3.3)
75%–100%	1 (1.6)

[a] Site 1 is an academic general internal medicine practice in a University-Affiliated public hospital, Site 2 is an academic general internal medicine practice in a University-affiliated hospital, Site 3 is an HIV practice in a University-affiliated public hospital.

encounters. Among Assist components, 42.6% reported having assisted patients with setting a quit date, 52.5% discussed medications for cessation, and 37.7% provided referrals to smoking cessation resources "most of the time" or "always" during clinical encounters (Fig. 2B). Clinician demographics and practice characteristics were not associated with adherence to the 5As (data not shown).

3.3. Association of patient-reported receipt of the 5As with clinician-reported adherence to the 5As

The 61 clinicians cared for 214 of the sampled patients (Supplementary Table 3). In subgroup analysis of patient and clinician clusters, clinician-report of having advised patients to quit smoking "most of the times" or "always" during clinical encounters was positively associated with patient-report of receipt of Advise (AOR 1.9, 95% CI 1.1–3.6) during the index visit. Clinician-report of arranging follow-up overall during clinical encounters was negatively associated with patients' corresponding self-report of receipt of Arrange (AOR 0.3, 95% CI 0.1–0.8) during the index visit. Clinician-report was not associated with patient report of the other 5As. Clinician report of all the 5As "most of the times" or "always" during clinical encounters was negatively associated with patient-report of receipt of all the 5As during the index visit (AOR 0.03, 95% CI 0.002–0.8).

4. Discussion

In this study of patients seeking care in primary care and HIV clinics, patient-reported receipt of some components of the 5As was lower than the national average and among commercially insured patients. In a nationally representative sample of patients seeking ambulatory care in the U.S. between 2005 and 2009, 62.7% were screened for tobacco use (Jamal et al., 2012) and among commercially insured patients 90% were screened for tobacco use by clinicians (Quinn et al., 2005) compared to 49.9% in our study. Prevalence of receiving advice to quit (40.9%) was higher among our patients compared to a nationally representative sample of patients seeking ambulatory care (20.9%) (Jamal et al., 2012) but lower than commercially insured patients (71%) (Quinn et al., 2005) Consistent with our hypothesis, patient reports of Assist and Arrange interventions were low and comparable to other patient populations in the U.S. (Park et al., 2015; Jamal et al., 2012; Quinn et al., 2005).

In the U.S., tobacco use is concentrated among low-income populations, those with low educational attainment, racial/ethnic minority groups, persons with mental health disorders and substance use disorders (Prevention CfDCa, 2014; Jamal et al., 2015; Schroeder and Morris, 2010). These high-risk populations were overrepresented in our study: about half of the patients had high school or less than high school education, two-thirds belonged to racial/ethnic minority groups,
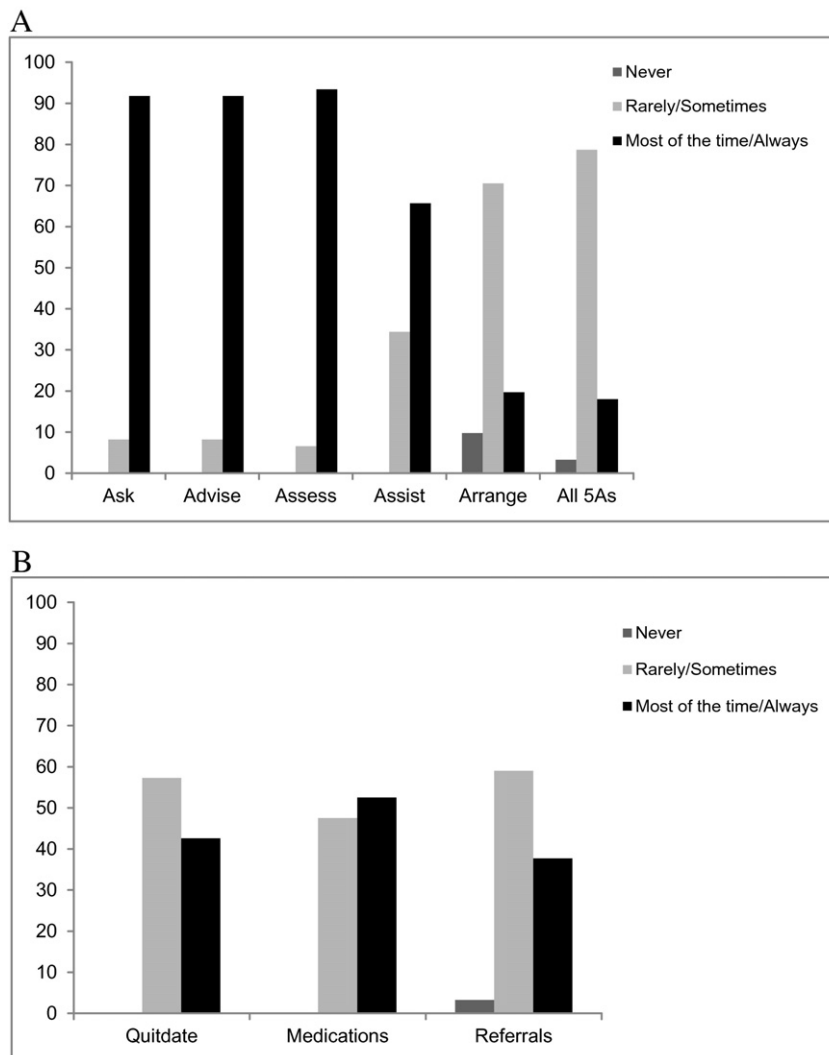
Fig. 2. A: Provider adherence to 5As (*N* = 61) B: Self-reported provider adherence to components of Assist (*N* = 61).

two-thirds were publicly insured, and the majority of patients had a diagnosis of mental health disorders or substance use disorders. Although guidelines recommend screening all patients for tobacco use (Fiore et al., 2008), only half the patients self-reported being asked about their smoking and fewer received the other 5As despite being at high risk for tobacco use (Centers for Disease Control and Prevention, 2008b).

As in previous studies (Quinn et al., 2005), with the exception of age no other demographic or tobacco use characteristics were associated with receipt of the 5As. Some clinicians may believe that younger patients are not motivated to quit smoking (Messer et al., 2008). Patients with cardiovascular or pulmonary disease were more likely to receive Assist or Arrange interventions, suggesting that clinicians may be better at counseling patients for secondary prevention rather than primary prevention (Houston et al., 2005).

Consistent with our hypothesis, patients in an HIV care clinic were less likely to report being asked, advised or assessed for smoking cessation compared to those in general medicine clinics. Persons living with HIV/AIDS have high rates of smoking (Vijayaraghavan et al., 2014; Burkhalter et al., 2005) and other medical and psychiatric comorbidities (Shirley et al., 2013) that may influence receipt of the 5As. Cigarette smoking is an independent risk factor for all-cause mortality among patients living with HIV/AIDS (Crothers et al., 2005; Helleberg et al., 2013). Our findings highlight disparities in receipt of 5As among patients living with HIV/AIDS, and suggest the need for targeted interventions for this population.

Clinician-reported adherence to Ask, Advise, and Assess was higher than what has been reported in previous studies, where estimates of provider-delivered Ask, Advise, and Assess has ranged between 60% and 75% (Goldstein et al., 1998; Schnoll et al., 2006). However, patient and clinician self-reports of Assist and Arrange were low. Receipt of these more intensive stages have been associated with increased quitting success and greater abstinence rates (Park et al., 2015; Quinn et al., 2005; Stead et al., 2008). Our findings have implications for improving clinician training on providing more intensive cessation interventions.

Although one-fourth of patients reported receiving information on medications for cessation, only a minority (6.5%) were prescribed medications during their last visit. The Affordable Care Act mandates coverage of treatment of tobacco dependence; however, significant state-level barriers exist in receipt of treatment (Singleterry et al., 2015). These include prior authorization requirements, annual limits on quit attempts, limits on duration, and required copayments, which may limit prescribing behavior among clinicians and accessibility among patients (Singleterry et al., 2015). Receipt of medications may also depend on patients' interest in quitting, with unmotivated patients less likely to receive medications than those who are motivated to quit smoking (Quinn et al., 2005). Clinician-level barriers may include lack of knowledge on prescribing medications for cessation or inadequate time to discuss medications among patients with medical and psychiatric comorbidities (Thorndike et al., 2007).

Although not a direct comparison, our findings of a discrepancy between patient-reported receipt of Arrange and clinician-report suggests that clinicians could be overestimating the rate at which they counsel patients or that patients may not comprehend clinician-delivered counseling. Clinicians may arrange follow-up without communicating that smoking cessation was the intent for follow-up; thus patient perceptions of Arrange may be different from that of clinicians. Interventions that rely on a personalized, mutually-agreed upon plan between patients and clinicians could increase receipt of interventions among smokers (Kalkhoran et al., 2016; Woods and Jaen, 2010). Receipt of all the 5As among patients and adherence to all the 5As among clinicians was low. A previous study reported that receipt of all the 5As among current smokers was associated with increased use of medications and counseling services (Kruger et al., 2016). Clinicians may not have provided assist and arrange interventions if patients were unwilling to

quit smoking. Our findings highlight implications of addressing all 5As irrespective of patients' readiness to quit smoking.

Our study had several limitations. Smoking status was assessed via self-report, which could lead to misclassification bias. However, self-report has been shown to be a reliable measure of smoking status among diverse patient populations (Studts et al., 2006; Bryant et al., 2011). Clinicians' adherence to the 5As was assessed by self-report of their overall practice rather than for the specific visit with the enrolled patient, limiting our ability to measure visit-level concordance between clinicians' and patients' self-reports. We were unable to determine whether receipt of Assisting and Arranging efforts were associated with patients' degree of motivation to quit smoking.

The diversity of our patient population suggests that findings could be generalizable to other high-risk populations seeking care in public primary care and HIV clinics. Despite guidelines that emphasize counseling for tobacco use for all patients, findings indicate low levels of cessation interventions among a vulnerable patient population that is at high risk for tobacco-related morbidity and mortality. Disparities in receipt of the 5As appeared to be heightened for persons living with HIV and AIDS. These findings highlight opportunities for implementing interventions that rely on a personalized, jointly agreed upon plan between patients and clinicians, and that harnesses the potential of information technology to facilitate clinician-delivered 5As for patients in primary care and HIV care clinics.

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Conflict of interest statement

Acknowledgments

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