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Factors associated with receipt of the 5As model of brief intervention for smoking cessation among hospitalized patients

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ABSTRACT

Background and Aims Guidelines recommend the 5As model of brief intervention for providing smoking cessation support in clinical settings. This study assessed patient and hospital characteristics associated with self-reported receipt of the 5As (ask, advise, assess, assist and arrange). **Design** Multi-center cross-sectional study. **Setting and participants** Adult inpatients (n = 1047) were randomly selected from 13 hospitals in the Barcelona province of Spain in 2014–2015. **Measurements** We explored participants' receipt of the 5As through a questionnaire. Given the progressiveness of the 5As, we recoded the fulfillment of the intervention as: A_0: no intervention; A_1: ask; A_2: ask and advise; A_3: A_2 and assess; A_4: A_3 and assist; and A_5: A_4 and arrange a follow-up. We explored patient (e.g. age, sex, comorbidities) and hospital (e.g. type of hospital, unit) characteristics. We adjusted multi-level robust Poisson regression models to estimate the adjusted prevalence ratios (aPR) of the association between the recoded 5As intervention received. **Findings** A total of 60.4% (n = 624) of patients had been asked (A_1) about their smoking status. Among smokers, 46.5% (n = 90) were advised (A_2), 26.6% (n = 48) assessed (A_3) and 4.6% (n = 10) received all the components of the 5As (A_5). Middle-aged smokers [aPR = 3.63; 95% confidence interval (CI) = 1.69–7.79] with a respiratory disease (aPR = 2.19; 95% CI = 1.11–4.34) were most likely to have been asked, advised and assessed (A_3). The cessation intervention was most frequently performed by physicians. **Conclusions** In the Barcelona province of Spain, it appears that fewer than half of hospitalized patients who smoke were advised to quit and few received the full 'five As' brief intervention for smoking cessation.

Keywords Guidelines, hospital, implementation, smoking cessation, survey, tobacco dependence.

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INTRODUCTION

Smoking is associated with many diseases and conditions that result in hospitalization, and affects the treatment and prognosis of inpatients [1]. Hospital-initiated smoking cessation is associated with statistically and clinically significant improvements in a range of health and quality of life measures [2], including the reduction of emergency department visits, hospital re-admissions and mortality [3]. The impact of receiving smoking cessation interventions in the hospital may be particularly powerful because patients are in a smoke-free environment, and their interaction with health-care providers offers a teachable moment to encourage quitting [4]. Thus, hospitalization is considered to be an optimal window of opportunity to engage smokers in smoking cessation [5] which, for those smokers who have particular difficulties quitting or maintaining abstinence, may be a unique way to start a smoking cessation process [6].

Article 14 of the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) [7] obligates parties to implement effective programs to assist individuals in quitting tobacco use. International guidelines recommend the 5As (ask, advise, assess, assist and arrange) model of brief intervention for providing smoking cessation in all clinical settings [7,8]. These guidelines have been adapted to different clinical care settings, including hospitals [9,10]. However, implementation of these guidelines differs considerably among countries [11,12] and health-care systems. Historically, smoking cessation services have been provided at the community level (e.g. primary care, quitlines) [13] and often neglected at the hospital level [14].

In 2011, the Spanish government implemented comprehensive smoke-free legislation in acute-care hospitals, requiring regional health administrators and hospital managers to provide smoking cessation interventions [14]. Ideally, all hospitalized patients who are smokers should receive services to reduce withdrawal symptoms and encourage smoking cessation. According to one study, 74% of Catalan hospitals had tobacco cessation programs for inpatient smokers with specific clinical protocols, and 69% had pharmacotherapy for this purpose in 2012 [15]. Nevertheless, the intensity and reach of these interventions has not been explored.

In order to monitor adherence to tobacco cessation guidelines, several studies have relied upon provider self-reports [16,17]. Studies conducted among health-care providers show a good implementation of the first two components of the 5As model, ask and advise, ranging from 60 to 75%, but lower implementation for the remaining following components [18–21]. Further, studies comparing the performance of providers with patients' perception show that providers tend to overestimate their performance [22,23].

Patient surveys conducted at the point of service are considered optimal for measuring provider delivery of smoking cessation services [18,24], and have been used in a number of studies in the United States [22,25,26]. In all cases, the smoking status of participants was determined by electronic health records or previous surveys, with the potential bias of misclassification. However, these studies were not specific for patients admitted to hospitals and they reported the receipt of smoking cessation services during the past 12 months. Few studies have explored inpatients' receipt of smoking cessation services at the time of admission [27,28], and were mainly conducted in specialized hospital settings (e.g. mental health, trauma, oncology) rather than in acute-care general hospitals [18,21,29].

To our knowledge, no studies have explored hospital inpatient receipt of smoking cessation in Spain, where 24.4% of adults (aged ≥ 15 years) [30] and 20.5% of hospitalized patients smoke [14]. Thus, the aim of the current study was to assess individual patient and hospital characteristics associated with self-reported receipt of the 5As of smoking cessation intervention among hospital inpatients.

METHODS

Design

We conducted a multi-center cross-sectional study among inpatients admitted to 13 acute-care hospitals of Barcelona province in Spain. Hospitals were selected by convenience out of 47 acute-care hospitals that are members of the Catalan Network for Smoke-free Hospitals and belong to the Province of Barcelona (www.xchsf.com).

Participants

Participants were inpatients aged more than 18 years who had been hospitalized for at least 24 hours at the time of the survey, who agreed to participate and who provided informed consent. We excluded inpatients from emergency room and intensive care units.

Sample sizes were calculated to be representative of each hospital and, after weighting the sample size, according to the number of beds in each. By doing so, the sample size was representative of the population of each acute-care hospital. Using an estimated smoking prevalence of 25.4% [31], with a precision of ± 3% and an alpha error of 5%, the required sample size was 1034 participants (Statcalc in EpiInfo, version 6.0.4). In each hospital, individuals were randomly selected from the daily updated admission list [14]. By design, substitution of index patients was allowed. When an index patient corresponded to an empty bed or was unavailable (e.g. in a test), or when the patient declined to participate, we invited the next patient on the list who fulfilled the inclusion/exclusion criteria (as detailed in the study protocol). In each hospital, this type of substitution accounted for less than 16% of the corresponding sample [14]. The main reasons for non-participation were: expressing no interest in participating in the research, not providing the informed consent and not feeling well at the time of approach. Using this method, we reached the necessary sample size in each hospital and globally in the study. Overall, we interviewed 1058 individuals, but 11 were excluded due to missing values.

Data collection

An 86-item *ad-hoc* questionnaire developed by an expert group from the Catalan Network for Smoke-free Hospitals was used to explore several tobacco-related dimensions [14] (available at: https://doi.org/10.6084/m9.figshare.11627184.v3). In this study, the main outcome was the level of smoking cessation intervention received

by respondents themselves during hospitalization, according to the 5As model for smoking cessation. We conceptualize the 5As model as composed of five steps that are progressive, and we re-coded the fulfilment of the 'main outcome' based on the response of participants and their cumulative reception as: A_0: no intervention; A_1: ask; A_2: ask and advise; A_3: ask, advise and assess; A_4: ask, advise, assess and assist; and A_5: ask, advise, assess, assist and arrange follow-up.

Participants were classified according to their smoking status at the time of the survey as (1) current smoker, defined as either a daily (one cigarette/day) or occasional smoker (fewer than one cigarette/day); (2) never smoker, defined as a person who had never smoked or had smoked fewer than 100 cigarettes in their life-time; or (3) former smoker, defined as a person who used to smoke, but had quit for at least 6 months [32].

Other patient-related variables were (1) sex; (2) age (based on the median distribution: < 45 years, 45–64 years and ≥ 65 years;); (3) education level (less than primary, primary, secondary and university); (4) employment status (employed, unemployed, retired and other); (5) partner's smoking status (without partner, non-smoker partner and smoker partner); (6) self-perceived health status (excellent, very good, good, poor, bad or very bad) and re-coded as 'optimal' (excellent, very good or good) and 'suboptimal' (poor, bad and very bad); (7) functional disability, according to the Barthel independence index (100 independent, < 100 dependent); (8) time since admission measured in days (re-coded as 1 , 2–5 and ≥ 6 days); and (9) comorbidities (hypertension, diabetes, pneumonia, kidney diseases, chronic liver diseases, cancer, heart diseases, stroke, cerebrovascular diseases and respiratory).

Hospital characteristics included (1) type of center (general or tertiary); (2) type of ward (surgical, medical–surgical or medical); (3) admission unit (respiratory, surgical or trauma, specialty wards such as oncology, psychiatry and others); (4) professional who performed the smoking cessation intervention (physician, nurse, psychotherapist, anesthetist, professional who did not identify her/himself); (5) hospital number of beds (≤ 300, > 300); (6) smoking prevalence among health-care professionals in the hospital ($\leq 30\%$, $> 30\%$)—prior research showed that approximately 30% of Catalan hospital workers were smokers [33]; (7) existence of smoking cessation program (yes/no); and (8) level of accreditation according to the Global Network for Tobacco Free Healthcare Services (gold, silver, bronze and member).

Statistical analysis

Descriptive analyses were performed according to participant and hospital characteristics. The main outcome variable was the fulfillment level of the 5As smoking cessation intervention self-reported by inpatients as a progressive model. Thus, when each component of intervention was received (according to patients' responses) was coded = 1 and when it was not received was recorded = 0. Due to the progressives nature of the 5As we re-coded the intervention as follows: A_0: no intervention, patients were not asked = 1; A_1: patients were asked = 1; A_2: patients were asked and advised = 1; A_3: patients were asked, advised and assessed = 1; A_4: patients were asked, advised, assessed and assisted = 1; and A_5: patients were asked, advised, assessed, assisted and arranged a follow-up = 1.

We did not include 18 patients because of missing values ($n = 12$) or inconsistent responses ($n = 6$, non-consecutive responses in the progressiveness of the As, i.e. recording being advised but not asked and assessed). Moreover, the variable 'comorbidities', that was initially composed of nine categories, was re-coded into four categories after running a principal component analysis (PCA). This analysis extracts linearly uncorrelated variables form a suite of potentially correlated variables. To simplify the interpretation of factors, we performed varimax rotation using Kaiser normalization. The categories were classified in four groups (respiratory diseases, cardiovascular diseases, neoplasm and liver–kidney diseases) (Cronbach's $\alpha = 0.551$). A fifth category was added for those patients without chronic diseases. Nonetheless, many patients had a combination of respiratory illnesses plus other diseases and these were classified following the distribution by which they occurred: (1) no chronic diseases, (2) respiratory diseases, (3) respiratory and cardiovascular diseases, (4) respiratory, neoplasm and/or liver–kidney diseases and (5) other combinations.

We fitted weighted Poisson regression multi-level models using robust variance with the individual patients as the first level and the hospital as the second level. The weight corresponding to each hospital was calculated by dividing 'the number of beds' by 'the number of patients interviewed'. The resulting value was multiplied by a factor (the total number of patients interviewed in all hospitals and the sum of beds in all hospitals), so that the total sum of the weights corresponded to the total of the sample. We estimated the association between each intervention implementation level and patients' socio-demographic characteristics through the prevalence ratios (PR) and 95% confidence intervals (CI). A_4 and A_5 were excluded from the analysis because lack of statistical power due to the low number of cases reporting these levels of service.

Results are presented as crude prevalence ratios (cPR) or adjusted PR (aPR) only for those variables that were explicative in the model (sex, age, time since admission in days, comorbidities, admission unit). For instance, after running the descriptive analysis we expected differences in the chances of receiving the 5As by the variable 'time since admission', and consequently we included it in the

model. Hospital characteristics, although included, did not contribute to the model and cPR and aPR are not reported for those variables. Statistical significance was set at $P < 0.05$. Analyses were conducted with SPSS version 21 and Stata version 13. The weights derived from the complex sample design were applied to all calculations.

It should be noted that neither the study nor the analysis plan were pre-registered on a publicly available platform, so the results should be considered exploratory.

RESULTS

Characteristics of the participants

Our final sample size was 1047 subjects. From this, 21.3% were current smokers, 33.0% former smokers and 45.7% never smokers (Table S1).

Level of smoking cessation intervention receipt by individual characteristics

As shown in Table 1, among all participants, 60.4% were asked (A_1) if they were smokers during their hospitalization. When comparing estimates of percentages between groups, confidence intervals that are non-overlapping reflect a statistically significant difference at $P < 0.05$. For example, patients aged < 45 years were significantly more frequently asked (66.3%; 95% CI = 60.2–72.4) than those aged ≥ 65 years (52.9%; 95% CI = 48.5–57.3). In addition, men were asked more frequently (67.3%; 95% CI = 63.3–71.3) than women (53.3%; 95% CI = 49.0–57.6), and those unemployed (77.8%; 95% CI = 68.3–87.3) were asked more frequently than retired and other patients (Table 1).

Among smokers ($n = 215$), the level of smoking cessation intervention achieved showed a decreasing trend: while 46.5% (95% CI = 39.8–53.2) achieved A_2 (ask and advise); only 4.6% (95% CI = 1.7–7.5) received a full smoking cessation intervention (A_5) during hospitalization (Table 1). For A_3 onwards smokers aged ≥ 65 years had lower rates of having received the 5As model for smoking cessation (Table 1). Moreover, 23 of the 215 smokers received A_4, meaning that they were assisted to quit during hospitalization. These 23 patients received individual counselling and 15 were given nicotine replacement therapy during their stay.

Level of smoking cessation intervention receipt by hospital characteristics

For A_1, no statistically significant differences were observed by hospital characteristics (Table 2). Nevertheless, we observed that smokers hospitalized in medical–surgical wards (6.3%; 95% CI = 0.0–19.0) had lower rates of receiving A_2 and onwards compared to patients admitted to medical wards (50.5%; 95% CI = 41.4–59.6) and surgical wards (47.6%; 95% CI = 36.8–58.4). Patients admitted to hospitals with > 300 beds and with > 30% smoking prevalence among health-care professionals were observed to receive A_2 more frequently than those admitted to hospitals with ≤ 300 beds and with ≤ 30% of smoking prevalence among health-care professionals, although this difference was not statistically significant (Table 2). However, patients admitted to hospitals with a bronze accreditation level received A_2 significantly more often (74.5%; 95% CI = 53.1–95.9) than patients admitted to gold accreditation level (37.5%; 95% CI = 26.5–48.5) (Table 2).

Level of intervention receipt by professional and unit of admission

As shown in Table 3, according to patients' self-report physicians were the health-care professionals who performed more smoking cessation intervention. The exception was for A_5, which was performed by nurses at a higher frequency, although not statistically significant. By unit of admission, patients admitted into psychiatric units received A_1 more frequently (90.9%; 95% CI = 78.9–100); however, for the consecutive levels of the 5As intervention we did not observe any statistically significant difference among units.

Predictors of receiving the smoking cessation intervention during hospitalization

Our multi-level analysis showed that being asked about smoking status (A_1) was more likely among current smokers (cPR 1.30; 95% CI = 1.18–1.44; Table 4), but this was explained by our adjusted model mainly because these patients were men (women: aPR = 0.79; 95% CI = 0.70–0.90); the middle-aged (45–64 years: aPR = 1.26; 95% CI = 1.12–1.41); and had respiratory diseases (aPR = 1.22; 95% CI = 1.04–1.43). Patients aged ≥ 65 years were approximately 30% (aPR = aged < 45 years: 1.30; 95% CI = 1.19–1.43; aPR = aged 45–64 years: 1.26; 95% CI = 1.12–1.41) more likely to be asked than younger patients. Among smokers, middle-aged smokers aged 45–65 years (aPR = 3.63; 95% CI = 1.69–7.79) with respiratory diseases (aPR = 2.19; 95% CI = 1.11–4.34) were more likely to have been asked, advised and assessed (A_3) compared to those aged ≥ 65 years and those with other comorbidities (Table 4). Similarly, we observed that patients admitted to psychiatric and medical and respiratory units were more likely to receive the 5As smoking cessation intervention (Table 4) than patients admitted to other units (Table 4). Finally, we observed that those patients hospitalized for fewer than 6 days were less likely to be asked, advised, assessed

Table 1 Level of intervention receipt by patients' socio-demographic and other individual characteristics.

	All						*Smokers*											
	A_0			A_1			A_2			A_3			A_4			A_5		
	n	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI
All	405	39.6	(36.6–42.6)	624	60.4	(57.4–63.4)	90	46.5	(39.8–53.2)	48	26.6	(20.5–32.7)	23	12.0	(7.5–16.5)	10	4.6	(1.7–7.5)
Sex																		
Men	167	32.7	(28.7–36.7)	348	67.3	(63.3–71.3)	68	50.0	(41.9–58.1)	36	28.7	(21.2–36.2)	17	11.8	(6.4–17.2)	8	4.7	(1.2–8.2)
Women	238	46.7	(42.4–51.0)	276	53.3	(49.0–57.6)	22	38.8	(27.1–50.5)	12	22.1	(12.0–32.2)	6	12.5	(4.5–20.5)	2	4.3	(0–9.2)
Age (years)																		
< 45	80	33.7	(27.6–39.8)	168	66.3	(60.2–72.4)	25	37.3	(26.2–48.4)	14	23.2	(13.3–33.1)	7	10.6	(3.4–17.8)	4	4.3	(0–9.0)
45–64	97	32.4	(27.2–37.6)	210	67.6	(62.4–72.8)	47	52.0	(42.1–61.9)	30	35.1	(25.5–44.7)	15	17.2	(9.5–24.9)	6	6.7	(1.6–11.8)
≥ 65	228	47.1	(42.7–51.5)	246	52.9	(48.5–57.3)	18	49.7	(34.6–64.8)	4	12.4	(2.1–22.7)	1	2.1	(0–6.6)	0	–	
Educational level																		
Less than primary	155	42.6	(37.6–47.6)	202	57.4	(52.4–62.4)	26	61.3	(47.8–74.8)	11	28.4	(15.2–41.6)	2	4.8	(0–11.1)	0	–	
Primary	124	39.2	(33.8–44.6)	202	60.8	(55.4–66.2)	41	45.0	(34.9–55.1)	22	24.5	(15.6–33.4)	13	12.8	(5.9–19.7)	6	4.1	(0–8.2)
Secondary	74	35.9	(29.3–42.5)	131	64.1	(57.5–70.7)	15	36.5	(23.4–49.6)	11	30.4	(17.7–43.1)	6	17.7	(7.2–28.2)	3	9.0	(1.1–16.9)
University	52	37.6	(29.3–45.9)	89	62.4	(54.1–70.7)	8	41.4	(19.3–63.5)	4	21.8	(2.7–40.9)	2	10.4	(0–24.5)	1	6.0	(0–17.0)
Occupation																		
Employed	97	32.8	(27.5–38.1)	217	67.2	(61.9–72.5)	39	43.7	(33.7–53.7)	22	25.9	(16.9–34.9)	10	10.2	(4.0–16.4)	5	4.4	(0.2–8.6)
Unemployed	20	22.2	(12.7–31.7)	54	77.8	(68.3–87.3)	16	61.8	(44.1–79.5)	8	36.3	(18.2–54.4)	4	17.0	(3.1–30.9)	1	1.5	(0–6.1)
Retired	236	45.0	(40.8–49.2)	292	55.0	(50.8–59.2)	31	43.3	(32.5–54.1)	14	20.8	(11.6–30.0)	7	10.6	(3.6–17.6)	3	5.4	(0.3–10.5)
Other	52	43.0	(34.0–52.0)	61	57.0	(48.0–66.0)	4	53.7	(21.1–86.3)	4	53.7	(21.1–86.3)	2	29.0	(0–60.4)	1	9.1	(0–27.9)
Partner's smoking status																		
Without a partner	119	38.0	(32.5–43.5)	187	62.0	(56.5–67.5)	35	53.5	(42.1–64.9)	18	28.3	(17.7–38.9)	10	12.8	(5.0–20.6)	5	4.6	(0–9.5)
Non-smoker partner	223	41.3	(37.2–45.4)	330	58.7	(54.6–62.8)	25	41.8	(30.0–53.6)	11	22.0	(11.7–32.3)	6	11.9	(3.8–20.0)	2	4.5	(0–9.7)
Smoker partner	62	37.5	(30.3–44.7)	106	62.5	(55.3–69.7)	30	45.0	(33.4–56.6)	19	29.8	(19.0–40.6)	7	11.8	(4.2–19.4)	3	4.7	(0–9.7)
Perceived health status																		
Optimal	228	37.3	(33.4–41.3)	378	62.7	(58.8–66.6)	54	43.0	(34.5–51.5)	27	23.2	(15.8–30.6)	13	11.3	(5.7–16.9)	5	3.8	(0.5–7.1)
Suboptimal	177	42.6	(38.0–47.2)	246	57.4	(52.8–62.0)	36	51.9	(41.2–62.6)	21	32.1	(21.7–42.5)	10	13.3	(5.7–20.9)	5	5.9	(0.6–11.2)
Functional disability[a]																		
Dependent	102	46.0	(39.5–52.5)	126	54.0	(47.5–60.5)	16	62.5	(45.7–79.3)	6	28.3	(11.3–45.3)	2	10.5	(0–22.1)	0	–	
Independent	303	37.8	(34.4–41.2)	498	62.2	(58.8–65.6)	74	43.6	(36.4–50.8)	42	26.3	(19.8–32.8)	21	12.3	(7.5–17.1)	10	5.3	(2.0–8.6)
Time since admission																		
1 day	50	46.8	(37.1–56.5)	65	53.2	(43.5–62.9)	5	23.3	(3.2–43.4)	4	18.1	(0–36.4)	2	7.0	(0–19.5)	1	4.5	(0–14.4)
2–5 days	191	41.2	(36.7–45.7)	271	58.8	(54.3–63.3)	36	44.1	(33.8–54.4)	17	21.2	(12.5–29.9)	5	5.7	(0.8–10.6)	3	3.4	(0–7.3)

(*Continues*)

Table 1. (Continued)

	All			*Smokers*													
	A_0			A_1			A_2			A_3			A_4			A_5		
	n	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI
≥ 6 days	163	37.0	(32.6–41.4)	282	63.0	(58.6–67.4)	49	53.4	(43.9–62.9)	27	33.5	(24.2–42.8)	16	18.7	(11.0–26.4)	6	5.7	(1.1–10.3)
Comorbidities[b]																		
Arterial hypertension	181	41.9	(37.3–46.5)	245	58.1	(53.5–62.7)	27	50.4	(37.7–63.1)	14	28.6	(16.9–40.3)	7	12.5	(3.9–21.1)	3	4.2	(0–9.5)
Diabetes	114	41.6	(35.7–47.5)	152	58.4	(52.5–64.3)	16	48.0	(31.2–64.8)	9	28.4	(12.5–44.3)	5	13.9	(1.7–26.1)	1	2.8	(0–8.6)
Pneumonia	77	35.6	(29.0–42.2)	135	64.4	(57.8–71.0)	18	61.8	(44.1–79.5)	9	36.4	(18.3–54.5)	1	3.3	(0–10.0)	1	3.3	(0–10.0)
Kidney diseases	84	44.5	(37.6–51.4)	114	55.5	(48.6–62.4)	14	57.9	(38.1–77.7)	6	30.4	(11.2–49.6)	2	8.7	(0–20.5)	1	3.6	(0–11.4)
Chronic liver diseases	56	42.6	(34.4–50.8)	73	57.4	(49.2–65.6)	13	45.1	(27.6–62.6)	9	31.7	(15.3–48.1)	3	6.8	(0–15.8)	1	1.4	(0–5.6)
Cancer	114	46.6	(40.4–52.8)	137	53.4	(47.2–59.6)	21	47.3	(32.9–61.7)	12	29.3	(15.7–42.9)	6	11.9	(2.2–21.6)	3	7.0	(0–14.6)
Heart diseases	102	39.3	(33.4–45.2)	154	60.7	(54.8–66.6)	20	57.2	(41.3–73.1)	11	33.1	(17.7–48.5)	5	11.1	(0.8–21.4)	3	5.5	(0–12.9)
Cerebrovascular diseases	45	41.7	(32.4–51.0)	63	58.3	(49.0–67.6)	9	71.7	(48.1–95.3)	3	29.6	(4.8–54.4)	0	–		0	–	
Respiratory diseases	75	37.3	(30.8–43.8)	131	62.7	(56.2–69.2)	27	62.5	(48.0–77.0)	13	34.7	(19.9–49.5)	5	8.8	(0–17.7)	3	5.0	(0–11.8)

[a]As measured with the Barthel index. [b]Multiple response; A_0: without intervention; A_1: Ask; A_2: A_1 + advise; A_3: A_2 + assess; A_4: A_3 + assist; A_5: A_4 + arrange. CI = confidence interval.

Table 2 Level of intervention receipt by characteristics of the hospital (level of hospital, number of beds, staff, etc).

	All			*Smokers*													
	A_0			A_1			A_2			A_3			A_4			A_5		
	n	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI	*n*	%	95% CI
Level of center																		
General hospital	88	36.7	(29.9–43.5)	155	63.3	(56.5–70.1)	21	38.8	(23.9–53.7)	10	17.7	(5.7–29.7)	9	14.9	(3.9–25.9)	6	9.9	(0.6–19.2)
Tertiary hospital	317	40.3	(37.0–43.6)	469	59.7	(56.4–63.0)	69	48.2	(40.8–55.6)	38	28.7	(21.8–35.6)	14	11.4	(6.5–16.3)	4	3.3	(0.6–6.0)
Type of ward																		
Surgical	147	42.3	(37.4–47.2)	206	57.7	(52.8–62.6)	34	47.6	(36.8–58.4)	15	22.0	(12.7–31.3)	6	9.3	(2.8–15.8)	3	5.3	(0.3–10.3)
Medical–surgical	51	44.5	(35.0–54.0)	74	55.5	(46.0–65.0)	1	6.3	(0–19.0)	1	6.3	(0–19.0)	0	–		0	–	
Medical	207	36.7	(32.6–40.8)	344	63.3	(59.2–67.4)	55	50.5	(41.4–59.6)	32	32.3	(23.6–41.0)	17	15.4	(8.7–22.1)	7	4.7	(0.8–8.6)
Number of beds																		
≤ 300	216	41.6	(37.2–46.0)	317	58.4	(54.0–62.8)	39	36.7	(27.2–46.2)	23	23.1	(14.7–31.5)	14	12.8	(6.1–19.5)	9	7.9	(2.5–13.3)
> 300	189	37.9	(33.9–41.9)	307	62.1	(58.1–66.1)	51	54.7	(45.6–63.8)	25	29.7	(21.0–38.4)	9	11.4	(5.4–17.4)	1	1.6	(0–4.0)
Staff per bed																		
≤ 5	208	41.3	(37.1–45.5)	311	58.7	(54.5–62.9)	49	46.3	(37.1–55.5)	27	27.6	(19.2–36.0)	11	11.3	(5.3–17.3)	5	5.0	(0.9–9.1)
> 5	197	37.8	(33.5–42.1)	313	62.2	(57.9–66.5)	41	46.7	(37.0–56.4)	21	25.5	(16.7–34.3)	12	12.8	(6.0–19.6)	5	4.0	(0–8.0)
HP smoking prevalence																		
≤ 30%	310	40.8	(37.2–44.4)	476	59.2	(55.6–62.8)	60	40.1	(32.0–48.2)	33	23.0	(15.9–30.1)	17	11.1	(5.8–16.4)	9	5.6	(1.7–9.5)
> 30%	95	37.1	(31.8–42.4)	148	62.9	(57.6–68.2)	30	59.0	(47.6–70.4)	15	34.1	(22.7–45.5)	6	13.9	(5.6–22.2)	1	2.6	(0–6.4)
Smoking cessation program																		
Yes	318	39.8	(36.5–43.1)	480	60.2	(56.9–63.5)	72	48.4	(41.1–55.7)	39	28.4	(21.6–35.2)	14	11.1	(6.4–15.8)	5	3.8	(0.9–6.7)
No	87	38.7	(31.3–46.1)	144	61.3	(53.9–68.7)	18	35.8	(19.4–52.2)	9	17.0	(4.2–29.8)	9	17.0	(4.2–29.8)	5	8.6	(0–18.2)
Accreditation level																		
Gold	143	44.8	(39.6–50.0)	187	55.2	(50.0–60.4)	23	37.5	(26.5–48.5)	10	19.6	(10.4–28.8)	5	10.0	(3.1–16.9)	2	4.1	(0–8.6)
Silver	125	39.9	(34.0–45.8)	188	60.1	(54.2–66.0)	19	32.3	(19.2–45.4)	11	19.1	(7.9–30.3)	7	12.1	(2.9–21.3)	4	7.1	(0–14.4)
Bronze	42	28.5	(19.6–37.4)	101	71.5	(62.6–80.4)	18	74.5	(53.1–95.9)	12	48.5	(24.7–72.3)	5	13.5	(0–30.2)	3	7.5	(0–20.4)
Member	95	37.1	(31.8–42.4)	148	62.9	(57.6–68.2)	30	59.0	(47.6–70.4)	15	34.1	(22.7–45.5)	6	13.9	(5.6–22.2)	1	2.6	(0–6.4)

A_0: without intervention; A_1: Ask; A_2: A_1 + advise; A_3: A_2 + assess; A_4: A_3 + assist; A_5: A_4 + arrange. CI = confidence interval; HP = hospital patients.

Table 3 Level of intervention receipt by professional and unit of admission.

	All			*Smokers*										
	A_1			A_2			A_3			A_4			A_5		
	n	%	*95% CI*	*n*	%	*95% CI*	*n*	%	*95% CI*	*n*	%	*95% CI*	*n*	%	*95% CI*
Received	624	60.4	(57.4–63.4)	90	46.5	(39.8–53.2)	48	26.6	(20.5–32.7)	23	12.0	(7.5–16.5)	10	4.6	(1.7–7.5)
Professional[a]															
Physician	478	76.3	(73.0–79.7)	80	88.9	(82.7–95.1)	42	85.2	(75.7–94.7)	16	62.5	(43.1–81.9)	4	44.4	(12.0–76.9)
Nurse	276	43.8	(39.9–47.7)	35	36.4	(26.9–45.8)	14	27.8	(15.8–39.7)	11	45.8	(25.9–65.8)	6	66.7	(35.9–97.5)
Physiotherapist	7	1.0	(0.2–1.7)	0	–		0	–		0	–		0	–	
Someone who did not identify	22	3.7	(2.2–5.2)	2	1.0	(0–3.0)	4	5.6	(0–11.7)	0	–		0	–	
Anesthetist	15	2.9	(1.6–4.2)	–			–			–			–		
Admission unit															
Oncology	44	47.1	(35.2–58.9)	5	26.7	(4.3–49.0)	2	6.7	(0–19.3)	1	6.7	(0–19.3)	0	–	
Medicine and respiratory	184	67.2	(61.8–72.7)	24	54.2	(40.1–68.3)	13	34.1	(20.1–48.1)	6	13.3	(3.4–23.3)	4	6.7	(0–14.0)
Surgery and trauma	151	56.1	(50.3–61.8)	24	43.5	(31.2–55.9)	12	20.7	(10.3–31.1)	4	6.9	(0.4–13.4)	1	1.7	(0–5.1)
Specialties	202	59.3	(54.0–64.6)	26	44.8	(32.9–56.7)	13	24.6	(14.1–35.1)	6	9.4	(2.2–16.5)	2	4.6	(0–9.7)
Psychiatry	20	90.9	(78.9–100)	8	62.5	(38.8–86.2)	7	50.0	(25.5–74.5)	5	41.2	(17.8–64.6)	2	11.8	(0–27.1)
Others	23	54.3	(37.8–70.8)	3	40.0	(0–82.9)	1	20.0	(0–55.1)	1	20.0	(0–55.1)	1	20.0	(0–55.1)

[a]Multiple response, there are missing values. A_0: without intervention; A_1: Ask; A_2: A_1 + advise; A_3: A_2 + assess; A_4: A_3 + assist; A_5: A_4 + arrange. CI = confidence interval.

Table 4 Predictors of being asked (A_1), advised (A_2) and assessed (A_3) during hospitalization.

	All				*Smokers*							
	A_1				A_2				A_3			
	cPR	*95% CI*	*aPR*	*95% CI*	*cPR*	*95% CI*	*aPR*	*95% CI*	*cPR*	*95% CI*	*aPR*	*95% CI*
Sex												
Men	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Women	0.78	(0.68–0.91)	0.79	(0.70–0.90)	0.82	(0.51–1.33)	0.81	(0.51–1.31)	0.75	(0.44–1.25)	0.71	(0.44–1.16)
Age (years)												
< 45	1.31	(1.15–1.49)	1.30	(1.19–1.43)	0.81	(0.58–1.13)	0.92	(0.60–1.40)	2.08	(1.05–4.13)	2.72	(1.33–5.58)
45–64	1.26	(1.10–1.45)	1.26	(1.12–1.41)	1.08	(0.83–1.41)	1.09	(0.81–1.46)	2.98	(1.47–6.02)	3.63	(1.69–7.79)
≥ 65	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Educational level												
Less than primary	1.00	–			1.00	–			1.00	–		
Primary	0.97	(0.89–1.06)			0.77	(0.51–1.17)			0.90	(0.35–2.33)		
Secondary	0.99	(0.83–1.18)			0.59	(0.29–1.21)			1.06	(0.26–4.36)		
University	0.97	(0.81–1.17)			0.70	(0.43–1.15)			0.78	(0.34–1.79)		
Occupation												
Employed	1.00	–			1.00	–			1.00	–		
Unemployed	1.12	(0.89–1.41)			1.29	(1.05–1.58)			1.15	(0.61–2.18)		
Retired	0.87	(0.76–0.99)			0.75	(0.40–1.40)			0.92	(0.44–1.92)		
Other	1.00	(0.85–1.18)			1.21	(0.50–2.93)			2.23	(0.97–5.15)		
Smoking status												
Current smoker	1.30	(1.18–1.44)										
Former smoker	1.05	(0.90–1.21)										
Never smoker	1.00	–										
Partner's smoking status												
Without a partner	1.00	–			1.00	–			1.00	–		
Non-smoker partner	0.94	(0.77–1.15)			0.72	(0.52–0.98)			0.96	(0.61–1.51)		
Smoker partner	0.96	(0.83–1.12)			0.86	(0.45–1.63)			1.06	(0.66–1.70)		
Perceived health status												
Optimal	1.00	–			1.00	–			1.00	–		
Suboptimal	0.97	(0.78–1.20)			1.16	(0.73–1.84)			1.38	(0.77–2.49)		
Functional disability[a]												
Dependent	1.00	–			1.00	–			1.00	–		

(*Continues*)

Table 4. (Continued)

	All				*Smokers*							
	A_1				A_2				A_3			
	cPR	*95% CI*	*aPR*	*95% CI*	*cPR*	*95% CI*	*aPR*	*95% CI*	*cPR*	*95% CI*	*aPR*	*95% CI*
Independent	1.06	(0.93–1.21)			0.73	(0.47–1.13)			0.90	(0.42–1.95)		
Time since admission (days)												
1	0.85	(0.71–1.02)	0.86	(0.73–1.02)	0.48	(0.17–1.32)	0.47	(0.19–1.19)	0.60	(0.13–2.88)	0.60	(0.13–2.69)
2–5	0.92	(0.82–1.04)	0.92	(0.82–1.03)	0.83	(0.66–1.04)	0.81	(0.65–1.00)	0.58	(0.30–1.15)	0.53	(0.29–0.99)
≥ 6	1.00	–			1.00	–	1.00	–	1.00	–	1.00	–
Comorbidities[b]												
No chronic disease	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Respiratory diseases	1.23	(1.04–1.45)	1.22	(1.04–1.43)	2.20	(1.41–3.43)	2.15	(1.36–3.40)	2.05	(1.15–3.67)	2.19	(1.11–4.34)
Respiratory and cardiovascular diseases	1.18	(0.94–1.48)	1.15	(0.92–1.45)	0.86	(0.31–2.36)	0.81	(0.30–2.19)	1.31	(0.43–4.01)	1.23	(0.44–3.47)
Respiratory, neoplasms and/or liver–kidney diseases	0.93	(0.68–1.27)	0.91	(0.67–1.25)	1.59	(0.60–4.22)	1.65	(0.65–4.18)	2.21	(0.71–6.88)	2.34	(0.79–6.90)
Other	1.03	(0.88–1.22)	1.01	(0.86–1.20)	1.25	(0.66–2.35)	1.28	(0.71–2.30)	1.20	(0.57–2.55)	1.21	(0.61–2.40)
Admission Unit												
Oncology	1.00	–			1.00	–			1.00	–		
Medicine and respiratory	1.49	(1.06–2.10)			2.11	(0.93–4.77)			4.35	(0.79–23.97)		
Surgery and trauma	1.25	(0.89–1.76)			1.70	(0.68–4.21)			2.78	(0.55–14.09)		
Specialties	1.32	(0.92–1.91)			1.76	(0.74–4.20)			3.08	(0.62–15.19)		
Psychiatry	1.81	(1.30–2.54)			2.87	(1.06–7.74)			7.17	(1.42–36.12)		
Others	1.20	(0.78–1.84)			1.54	(0.70–3.40)			1.62	(0.32–8.21)		

[a]As measured with the Barthel index. [b]Multiple response. CI = confidence interval; aPR = adjusted prevalence ratios; cPR = crude prevalence ratios.

(A_3) (Table 4) and assisted (A_4), but there were no differences in terms of being arranged a follow-up (A_5) (Table 1).

DISCUSSION

We examined self-reported inpatient receipt of the 5As model of brief intervention for smoking cessation. Overall, 60% of inpatients were asked about their smoking status. Being male, middle-aged (45–64 years) and having had a respiratory disease were individual factors associated with being more frequently asked about their smoking status (A_1). By hospital characteristics, patients admitted to medical, respiratory and psychiatric wards were more likely to be asked about smoking status (A_1). The level of fulfillment with the 5As model decreased steeply from advise (A_2) onwards, with only 4.6% of smokers receiving the full 5As intervention (A_5) during hospitalization. Finally, physicians, as reported by patients and compared to other health-care providers, were the professionals most likely to provide smoking cessation intervention.

Receipt of smoking cessation intervention during hospitalization has been associated with increased quit attempts and increased smoking cessation rates among hospitalized patients [2,34]. Furthermore, improved health and quality of life together with cost savings in the health system have also been demonstrated [3]. After 2011, Spanish hospitals are expected to provide smoking cessation aid to patients and in Catalonia, 1 year after passing this law, 74% of hospitals had tobacco cessation programs [15]. Nonetheless, providing smoking cessation services is not compulsory [35] and this may explain why patients reported a suboptimal level of receipt of the 5As. Receipt of smoking cessation services was lower in our study than reported in other countries with stronger tobacco control efforts [18,28,36,37]. According to studies from Australia, Canada, the United States and the United Kingdom, more than three-quarters of smokers are asked about their smoking status [18,20,28]. Moreover, 95% of patients who have had some health conditions—such as cardiovascular and respiratory illness—receive smoking cessation counseling in the United States [6,38].

A recent study from Missouri reported that 18–24% of inpatients received tobacco cessation pharmacotherapy during hospitalization [39]. In that study, patients reported receiving significantly lower rates of smoking cessation intervention when compared with provider reports [39,40], a finding also seen in previous studies [22,23]. The Missouri study also found that males, younger patients and those admitted to psychiatric and medical units were more likely to receive pharmacological aids [39]. The authors suggested that their results reflected the high comorbidity of smoking among patients on those units and exposed a tendency for providers to ask about smoking among young males, a bias also identified in our study. However, the Missouri study included only one hospital, while our results refer to data from 13 hospitals with more than 1000 randomly selected patients.

We found that patients admitted to hospitals with higher smoking prevalence among health-care professionals and with bronze accreditation level were more often asked about smoking and advised to quit. Previous research has identified that pharmacological aids [15], continuous monitoring to ensure compliance by hospital administrators and health authorities [41] and training by health professionals [42] were associated with providing smoking cessation interventions. Our study explored several of these factors, but did not study training. However, a previous study conducted in Catalonia showed that training health professionals increases the level of performance of the 5As [19]. In this sense, future research should continue exploring these factors at multiple levels, including the ones we have explored in this study that characterize patients (such as age, gender and comorbidities) and hospitals (such as unit of admission and provision of smoking cessation services).

The low level of provision of smoking cessation services in hospitals has two implications. The first is that health-care providers lose the opportunity to encourage patients to quit at a favorable moment [43,44], and the second is that patients may suffer from tobacco withdrawal symptoms [39,45] that interfere with their stability and tranquility during hospitalization.

This is the first study, to our knowledge, to explore the frequency with which hospitalized patients are asked about their smoking status, according to their individual characteristics and the characteristics of the unit and hospital where they were treated. Males, middle-aged and patients admitted to medical units were most frequently asked about their smoking status. This means that other patients—for example, women or those admitted to other hospital units—were less likely to be asked about their smoking, and less likely to receive smoking cessation intervention. Although there are some smoking-related diseases that can cause hospitalization such as respiratory illness, inpatients with and without smoking-related diagnoses improve their outcomes when quitting in the hospital settings [2]. These results point out the need to raise awareness and train health-care providers from all wards and departments in the importance of asking and providing all components of the 5As model when they encounter a smoker [46,47].

Some research has identified barriers to implementing the full 5As model [48,49], and a shorter 3As 'ask–advise–refer/act/connect' has been suggested [34,50–52]. These shorter models have been used mainly in ambulatory settings [52] and with a focus on referring patients to telephone Quitline services [53]. The preponderance of knowledge on this topic suggests that delivery of all the

components of the 5As model is associated with a greater use of cessation treatments [22]. Even receipt of three or four of the 5As promotes quitting more than the receipt of only one or none of 5As components [22]. This indicates that the more thoroughly health professionals apply the 5As, the better the results that can be expected. In any case, hospital-based health-care providers should deliver the full 5As model and go beyond the most frequent reported (ask, advise) components. The relative effectiveness of the 5As and the 3As model may vary by health-care setting and should be explored in further research.

Finally, organizational change models [47,54,55] and system-level implementation strategies [40] have been applied to improve the inadequate implementation of smoking cessation interventions for hospitalized patients who smoke. Health-care system changes, which integrate smoking cessation interventions into routine clinical care, have been found to increase the likelihood that hospital health-care providers regularly screen their patients' smoking status and provide support to quit. In these projects several actions are integrated within the organization, including provider training, strong commitment from the organization, continuous support of managers, access to tobacco dependence treatments and accountability of results [56,57]. In addition, it has also been demonstrated that the requests to hospitals by the health-care bodies (such as Joint Commission and the Center for Medicare and Medicaid Services in the United States) of smoking cessation intervention metrics boost the performance of these services [6,56].

Limitations and strengths

This study has some limitations. First, our data represent clients admitted to 13 of the 47 acute-care hospitals in Catalonia. Those 13 hospitals were included because they were members of the Catalan Network for Smoke Free Hospitals and were willing to participate. As they were part of this Network, it is possible that these hospitals had greater interest than other hospitals in addressing smoking among their patients. If that were the case, then our findings may be biased towards overestimating the provision of smoking cessation services in the entire Catalan acute-care hospital system. Thus, provision of services in Catalan hospitals may be lower than we reported, but are not likely to be higher than we reported. Secondly, data used in this study reflect patients' self-reported receipt and use of cessation interventions from a health professional, which may be subject to recall bias. However, potential recall bias is mitigated because we asked at the time of hospitalization and not during any prior period (e.g. the last 12 months), as other studies have done [26]. Patients' perceptions about receipt of the 5As by health-care providers, moreover, should be of importance when evaluating the implementation of the intervention. Thirdly, we conducted the study in only one province in Spain. Although health coverage is provided by a unique National Health System within Spain, the provision of smoking cessation services may differ slightly in different areas. However, we included procedures to support generalizability, and we designed methods to increase internal and external validity. We calculated the sample size per hospital, included all types of wards (surgical, medical and medical–surgical) and had a low participant substitution rate (ranging from 10 to 16% in the 13 hospitals). As non-participant inpatients did not complete consent procedures, we did not collect individual characteristics for this group, and we cannot compare their profile with those who participated. However, given the substitution method, we believe that the substitute patients were very similar to the index patients. These patients were usually admitted to the same ward and even hospitalized in the same room, thus very likely to be of the same sex, disease category and even age range. Moreover, in all participating hospitals we reached the sample size necessary for assuring inference. Furthermore, the age of the sample was older than the population of Catalonia, as people admitted into hospitals tend to be older than the general population. However, the purpose of the study was to select a representative sample of inpatients in Catalonia and not a representative sample of the general population. In this sense, by using the randomization method employed, we are confident that our sample represents the population of inpatients in Catalonia. Additionally, time since admission could affect the results. Nevertheless, we only found that inpatients interviewed with fewer than 6 days of time since admission had lower chances of being asked, advised, assessed (A_3) and additionally assisted (A_4), or of having follow-up arranged (A_5). Otherwise, an important strength is that we employed a piloted questionnaire and included several of the measurements that are used in tobacco control literature (such as the definition of smoking cessation provision using the 5As, smoking status, etc.). Finally, this study is the first to assess patients' receipt of smoking cessation services in hospitals with the largest and most diverse exploration to date of tobacco-related services among acute hospital inpatient services in Catalonia. In addition, we conducted a multi-level analysis approach considering the inter- and intravariability of patients across and within hospitals for selected aggregated variables.

CONCLUSIONS

Approximately 60% of patients were asked about their smoking status. Men, the middle-aged and those with a

respiratory disease were most frequently asked. Fewer than half of smokers received advice to quit smoking during hospitalization, and only 4.6% received all the components of the 5As model. Our results suggest that few hospitalized patients who smoke receive the brief intervention for smoking cessation, suggesting twofold consequences: (1) currently there are missed opportunities to encourage smoking cessation in a smoke-free environment and (2) these patients could suffer from tobacco withdrawal symptoms during their stay. Hospitals should implement more targeted and focused strategies to support smokers in a teachable moment such as hospitalization. Some strategies that have demonstrated good results are the implementation of organizational change projects, the introduction of a briefer intervention model and that standards promulgated by health-care authorities require provision of smoking cessation intervention for hospitalized patients who smoke.

Full list of participating members

The participants who contributed to the study and the participating hospitals and coordinator were as follows: the Catalan Institute of Oncology (Tarsila Ferro); Hospital Universitàri Vall d'Hebron (José Maria Sánchez-García, Gemma Nieva); Hospital Sant Joan de Déu d'Althaia (Antònia Raich); Hospital Trias i Pujol (Jorge Sanz); Hospital de Mataró (Margarita Cano); Hospital Clínic (Manel Santiñà); Hospital Sant Camil (Joan Prats); Hospital General de Vic (Miquel Vilardell); Hospital del Mar (Consòl Serra); Hospital de Mollet (Gemma Mayor); Hospital de Bellvitge (Josep María Ramon); and Hospital Moisès Broggi (Ruth Ripoll and Àngels Ruz). Finally, we appreciate the support of the rest of the ETHIF Research members, including Pilar Fuster, Javier Montes Cecilia Brando, Rosa Suñer, Anna Capsada, Francesc Abella and Antònia Raich.

Declaration of interests

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Author Contributions

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1 Smoking Status by individual independent variables.