

- 17 Barbosa Filho VC, Bandeira AD, Minatto G, et al. Effect of a multicomponent intervention on lifestyle factors among Brazilian adolescents from low Human Development Index areas: a cluster-randomized controlled trial. *Int J Environ Res Public Health* 2019;16:e267.
- 18 Petticrew M. When are complex interventions 'complex'? When are simple interventions 'simple'? *Eur J Public Health* 2011;21:397–8.
- 19 Furness C, Howard E, Limb E, et al. Relating process evaluation measures to complex intervention outcomes: findings from the PACE-UP primary care pedometer-based walking trial. *Trials* 2018;19:58.
- 20 Taylor W, Yancey A, Leslie J, et al. Physical activity among African American and Latino middle school girls: consistent beliefs, expectations, and experiences across two sites. *Women Health* 2000;30:67–82.
- 21 van den Berg V, Vos EE, de Groot RHM, et al. Untapped resources: 10- to 13-year-old primary schoolchildren's views on additional physical activity in the school setting: a Focus Group Study. *Int J Environ Res Public Health* 2018;15:e2713.
- 22 Wilson DK, Kitzman-Ulrich H, Williams JE, et al. An overview of "The Active by Choice Today" (ACT) trial for increasing physical activity. *Contemp Clin Trials* 2008;29:21–31.
- 23 Yeager DS, Dahl RE, Dweck CS. Why interventions to influence adolescent behavior often fail but could succeed. *Perspect Psychol Sci* 2018;13:101–22.
- 24 Wang M-T, Degol JL. School climate: a review of the construct, measurement, and impact on student outcomes. *Educ Psychol Rev* 2016;28:315–52.
- 25 Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol* 2000;55:68–78.
- 26 Zhang T, Solmon M. Integrating self-determination theory with the social ecological model to understand students' physical activity behaviors. *Int Rev Sport Exerc Psychol* 2013;6:54–76.
- 27 Armanasco AA, Miller YD, Fjeldsoe BS, Marshall AL. Preventive health behavior change text message interventions: a meta-analysis. *Am J Prev Med* 2017;52:391–402.
- 28 Patel MS, Asch DA, Volpp KG. Wearable devices as facilitators, not drivers, of health behavior change. *JAMA* 2015;313:459–60.
- 29 Davison K, Cutting TM, Birch LL. Parents' activity-related practices predict girls' physical activity. *Med. Sci Sports Exerc* 2003;35:1589–95.

.....  
*The European Journal of Public Health*, Vol. 30, No. 3, 466–472

© The Author(s) 2020. Published by Oxford University Press on behalf of the European Public Health Association. All rights reserved.  
 doi:10.1093/eurpub/ckaa019 Advance Access published on 14 February 2020  
 .....

## Do healthy doctors deliver better messages of health promotion to their patients?: Data from the SUN cohort study

Silvia Carlos<sup>1,2</sup>, Anaïs Rico-Campà<sup>1,2,3</sup>, Carmen de la Fuente-Arrillaga<sup>1,2,3</sup>, María Echavarri<sup>1</sup>, Alejandro Fernandez-Montero<sup>2,4</sup>, Alfredo Gea<sup>1,2,3</sup>, Camino Salazar<sup>5</sup>, Miguel Angel Martínez-González<sup>1,2,3</sup>

1 Department of Preventive Medicine and Public Health, University of Navarra, Pamplona, Spain

2 IdiSNA, Navarra Institute for Health Research, Pamplona, Navarra, Spain

3 Centro de Investigación Biomédica en Red Área de Fisiopatología de la Obesidad y la Nutrición (CIBEROBN), Madrid, Spain

4 Department of Occupational Medicine, University of Navarra, Pamplona, Spain

5 Unidad Docente Multiprofesional de Atención Familiar y Comunitaria, Sanidad de Castilla y Leon (SACYL), Palencia, Spain

**Correspondence:** Silvia Carlos, Facultad de Medicina, Departamento de Medicina Preventiva y Salud Pública, C/Irunlarrea, s/n. 31008 Pamplona, Spain, Tel: +34 948 425600, Fax: +34 948 425 740, e-mail: scarlos@unav.es

**Background:** Healthy lifestyle adherence is associated with lower chronic disease morbidity/mortality. The role of doctors, as counselors and role models, is essential. Among physicians participating in a prospective cohort, we investigated the behavioral counseling on diet and lifestyle provided to their patients in association with their own personal behaviors. **Methods:** We assessed 890 doctors aged ≤65 years participating in the 'Seguimiento Universidad de Navarra' (SUN) cohort, who replied to an online questionnaire regarding their practices on behavioral counseling and drug prescription to their patients. Data were combined with previous baseline information on their personal healthy habits. **Results:** Among doctors, 31% reported <10 min per visit; 73% counseled 60–100% of their patients on smoking cessation, 58% on physical activity, 54% on weight control, 51% on healthy nutrition, 44% on alcohol avoidance/reduction and 28% recommended alcohol moderate consumption. The percentage of doctors that counseled 100% of their patients about lifestyle was 43% for smoking cessation, 15% for exercise and 13% for weight control and nutrition. Better doctor's adherence to the Mediterranean dietary pattern was associated with more frequent and longer nutrition counseling. Higher practice of physical activity was associated with longer time on counseling about exercise to their patients. Among doctors both current and former smoking were inversely associated with the frequency and duration of their smoking cessation/avoidance counseling practices. **Conclusions:** Personal behavioral changes among doctors and better training of medical doctors on a personal healthy diet and lifestyle are likely to contribute to improve the behavioral counseling given to patients.

.....

## Introduction

An urgent need to foster lifestyle changes by health professionals is needed to confront the huge prevalence of non-communicable diseases (NCDs), responsible for 71% of global deaths.<sup>1</sup> The avoidance of specific behavioral risk factors and adherence to a healthy lifestyle are associated with lower morbidity and mortality. If preventive interventions are delivered early, costly treatments can be avoided and NCD-premature mortality can be reduced by one-third by 2030.<sup>1</sup> The role of healthcare professionals addressing the main behavioral factors and promoting empowerment is essential. Recent reviews of the US Preventive Service Task Force (USPSTF) have shown the benefits of behavioral counseling on cardiovascular disease prevention among non-obese adults not having common CVD risk factors<sup>2</sup>; or the positive effect of alcohol reduction counseling.<sup>3</sup>

However, although clinicians' counseling and support are positive predictors of changes in lifestyle,<sup>4,5</sup> helping patients to control risk factors remains a challenge that requires the involvement of healthcare providers. Patients expect physicians to help them with lifestyle changes and health professionals also become role models as a result of their behaviors.<sup>6</sup> Doctors are willing to help patients although they find some barriers (e.g. deficient training, time limitations or sensitivities around specific topics).<sup>7,8</sup>

We analyzed in a subset of doctors participating in the 'Seguimiento Universidad de Navarra' (SUN) cohort, the frequency and time spent on behavioral counseling and drug prescription, and the association with the doctors' characteristics and personal lifestyle.

## Methods

### Design and sample

This is a substudy within the SUN dynamic, open, prospective cohort study, which evaluates since December 1999 the effects of diet/lifestyle on NCDs, among graduates from the University of Navarra and other Spanish universities.<sup>9</sup> For this substudy, we selected physicians participating in this cohort in May 2018, excluding those without an email and those older than 65 years (retirement age).

### Data collection

All doctors had responded to the SUN study baseline questionnaire (Q0) including sociodemographics, anthropometrics, lifestyle and diet (a validated 136-item semi-quantitative food frequency questionnaire was used).<sup>10,11</sup>

For this substudy, we sent a short online questionnaire collecting data on their clinical specialty, clinical practice regarding counseling on a healthy lifestyle and prescription of preventive medications.

We inquired on the percentage of patients (0%/<20%/20–39%/40–59%/60–69%/70–99%/100%) they counseled about: weight, nutrition, exercise, alcohol and smoking cessation/avoidance.

We id="240" collected data on the time spent for each counseling: 0/>0–<5/5–9/10–14/15–29/≥30 min/patient.

Finally, we evaluated the prescription of medications ('less/equal/more than colleagues') for preventing NCDs or treating risk factors (antiobesity, lipid-lowering, antiosteoporosis, antihypertensives, aspirin, menopausal hormone therapy and multivitamins).

Up to three reminder emails were sent to improve response rates.

### Statistical analysis

Data from the doctors' questionnaire were merged with their Q0 data on diet and lifestyle.

Descriptive and multivariate logistic regression analyses were done with two different dependent variables: (i) counseling practice (% of patients counseled, recategorized as 0=0 to <60% and 1=60–100%) and (ii) counseling time (0 = ≤5 and 1 = >5 min).

Separated models were fitted for each counseling practice: weight, nutrition, exercise, alcohol avoidance/reduction, alcohol moderate consumption, smoking cessation and smoking avoidance among non-smokers.

The independent variables in all models were: (i) sociodemographic and professional characteristics [postgraduate studies, specialty 'Endocrinology/General Physicians (GP)/Others', currently attending patients 'yes/no']; (ii) body mass index (BMI), categorized as 'normal weight' (<25 kg/m<sup>2</sup>), 'overweight' (25–30 kg/m<sup>2</sup>) and 'obesity' (>30 kg/m<sup>2</sup>); (iii) health-related behaviors: MedDiet adherence (considering the 0–9 Trichopoulos score<sup>12</sup> categorized as: 0–2, 3–5, 6–9); physical activity (METs, tertiles), smoking (never/former/current), alcohol consumption (g/day) (for women and men: <5 or <10/5–25 or 10–50/>25–125 or >50–125, respectively); and (iv) prescribing practices.

All *P*-values are two-tailed; *P* < 0.05 was considered statistically significant. Statistical analyses were done with Stata v.12.0.

### Ethical aspects

Ethical approval from the University of Navarra Ethics Committee was obtained. Informed consent was sent to all participants, who had the right to refuse to participate or withdraw at any time without reprisal, according to the Declaration of Helsinki.

## Results

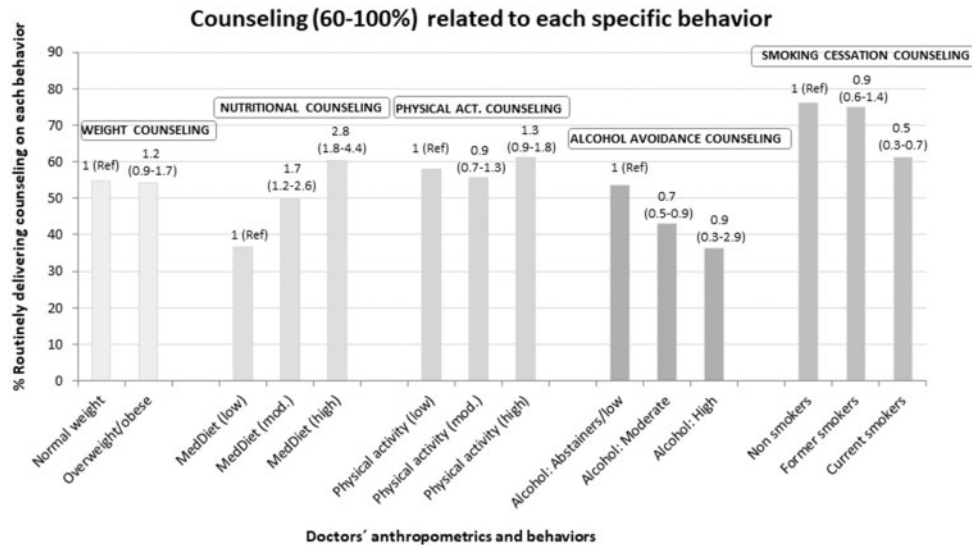
We collected data from 890 doctors (among 22 800 participants in the SUN cohort at study time). The response rate was 37% (890/2371). The mean time in the cohort since their Q0 was 13.1 (SD: 3.9) years.

Mean age of doctors was 51.7 (SD: 9.4) years, 52% were male, and 60% married. When we compared these data with the baseline characteristics of all SUN study doctors aged ≤65 years, the prevalence of men was similar (49%), as that of married (58%), but the mean age among all doctors was lower (39.3 years; SD: 11.0).

Most doctors (86%) were involved in clinical care. The main specialties were Family Medicine (24%), Internal Medicine (11%), Pediatrics (4%), Ophthalmology (4%) and Occupational-Medicine (3%). Approximately one-third (32%) of doctors had a doctorate (PhD) or master. Among all SUN study doctors, 28% reported PhD/master studies.

Regarding their baseline anthropometrics, doctors' mean weight was 59.7 (SD: 8.5) kg for women (6 pregnant women excluded) and 78.2 (SD: 10.5) kg for men (14% and 2% of overweight or obese women, and 45% and 5% of overweight or obese men, respectively). At baseline around half of the doctors had moderate MedDiet adherence (3–5 points) and 29% high adherence (6–9 points); 16% were smokers and 24% former smokers; and 21% of male and 5% of female doctors reported a high alcohol consumption (>15 g/day) (mean intakes (g/day): 9.6 (SD: 12.3) for men and 4.1 (SD: 6.3) for women).

Regarding counseling practices, doctors informed most of their patients (60–100%) on smoking cessation (73%) (figure 1). Smoking cessation was the most frequently provided counseling. We found that 8% of doctors counseled 60–69% of their patients about smoking cessation, 22% counseled 70–99% and 43% counseled 100% of their patients. Physical activity promotion was another frequently given counseling. However, only 15% of doctors counseled 100% of their patients on physical activity, 26% of doctors gave counseling to 70–99% of their patients and 17% of doctors gave counseling to 60–69% of their patients on physical activity. For weight control and nutritional advice, around 50% of physicians counseled 60–100% of their patients. Only 13% of doctors counseled 100% of their patients, 17% informed 60–69% of their patients and 24% informed 70–99% of their patients on weight control and nutritional advice. They talked less about alcohol (44% addressed alcohol avoidance/reduction and 28% alcohol moderate consumption). A similar trend was observed for the time counseling on each



**Figure 1** Prevalence of behavioral counseling (60–100% patients) and time on counseling in association with medical doctors personal nutritional and lifestyle characteristics (age and sex-adjusted odds ratios)

behavior: 27% spent >5 min counseling on smoking cessation; 22% on nutrition; 20% on weight control; 18% on physical activity; and 15% and 7% on alcohol avoidance/reduction and moderate consumption, respectively. Considering the mean time spent on behavioral counseling, 31% spent <10 min/visit (GPs: 49%, endocrinologists: 19% and other specialties: 26%).

Most doctors registered smoking status (72%) in most patients' clinical records, near 60% registered alcohol for most patients (60–100%), 57% registered weight, 43% registered height and only 11% waist circumference.

Table 1 shows the characteristics associated with counseling and time on counseling. After adjusting for all sociodemographics, female doctors were significantly more likely to deliver behavioral counseling on weight control [odds ratio (OR) 1.5; 95% confidence interval (CI): 1.1–2.0], diet/nutrition (OR 1.9; 95% CI 1.4–2.5), exercise (OR 1.5; 95% CI 1.2–2.1) and alcohol consumption reduction/avoidance (OR 1.9; 95% CI 1.4–2.5). They were also significantly more likely to spend >5 min counseling on weight (OR 2.3; 95% CI 1.6–3.3), nutrition (OR 2.4; 95% CI 1.7–3.4), exercise (OR 2.1; 95% CI 1.4–3.0), alcohol avoidance (OR 2.3; 95% CI 1.5–3.4), smoking cessation (OR 1.8; 95% CI 1.3–2.4) and avoidance of smoking among non-smokers (OR 2.1; 95% CI 1.2–3.5). The doctor's age was not associated with different frequencies of counseling.

Unexpectedly, having a PhD/master was inversely associated with counseling on alcohol avoidance (OR 0.7; 95% CI 0.5–0.9). Being an endocrinologist, compared with other specialists, was strongly associated with counseling on weight (OR 6.6; 95% CI 1.5–29.8), nutrition (OR 6.5; 95% CI 1.4–29.4), exercise (OR 5.2; 95% CI 1.2–23.7) and alcohol consumption avoidance/reduction (OR 3.3; 95% CI 1.1–10.0). They also spent a significantly longer time on weight counseling (OR 3.0; 95% CI 1.0–8.6) and nutrition (OR 4.2; 95% CI 1.5–11.9). GPs were also more likely than other specialists to provide advice on weight (OR 1.4; 95% CI 1.0–1.9), nutrition (OR 1.4; 95% CI 1.0–1.9), exercise (OR 1.6; 95% CI 1.1–2.2), alcohol consumption avoidance/reduction (OR 1.9; 95% CI 1.4–2.7) and moderation of alcohol consumption (OR 2.1; 95% CI 1.5–2.9). They spent longer time on counseling on smoking cessation (OR 1.9; 95% CI 1.3–2.6) than other specialists.

Doctors currently attending patients were less likely to counsel on the above-mentioned behaviors, compared with those not taking care of patients.

When we evaluated the adjusted association between doctors' anthropometrics and lifestyle and their counseling (table 2 and figure 1), we found no differences between normal weight doctors and

those overweight or obese regarding their counseling on weight. The same was observed for their physical activity and their counseling on exercise. However, we found that doctors with better MedDiet adherence were significantly more likely than those with low adherence to counsel on nutrition (high adherence: adjusted OR 2.7; 95% CI 1.7–4.4; medium adherence: adjusted OR 1.7; 95% CI 1.1–2.7). Current smoking among doctors was inversely associated with counseling patients on smoking cessation (adjusted OR 0.5; 95% CI 0.3–0.7). Likewise, both current and former smokers were less likely to counsel about smoking avoidance among non-smokers (adjusted OR 0.6; 95% CI 0.4–0.9).

With regards to the time spent on counseling (table 2 and figure 1), physically active doctors spent longer time counseling on exercise compared with doctors with low physical activity (OR 1.8; 95% CI 1.1–2.8).

Finally, when we analyzed the association between the doctors' prescribing practices and their counseling practices (table 3), we observed that in general doctors who reported prescribing more frequently than their colleagues preventive medications (antiobesity, lipid-lowering drugs, aspirin, antiosteoporotic, antihypertensive or vitamins) were more likely to deliver counseling on health-related behaviors than those doctors prescribing less frequently these drugs.

## Discussion

Among 890 doctors participating in the SUN cohort, the behavior they most frequently targeted in patient counseling was smoking cessation, followed by physical activity and weight control. Their personal nutritional and lifestyle characteristics were related to their frequency in delivering preventive counseling to their patients addressing these factors, with significant differences for counseling on nutrition, alcohol consumption and smoking, in age- and sex-adjusted analyses.

Female doctors were significantly more likely to deliver counseling and spend longer time on weight loss, nutrition, physical activity and alcohol. Similarly, a recent study among US obstetricians/gynecologists found that female doctors were more likely to address obesity control.<sup>5</sup> Literature shows that male and female doctors may practice differently, for example women are more likely to provide more preventive and psychosocial counseling.<sup>13</sup> Another study including 177 599 patients from US outpatient centers found that 17% received counseling on diet/nutrition, 12% on exercise and 5% on weight, and that those with chronic diseases were more likely

**Table 1** Characteristics of doctors and their association with their counseling practice and time on counseling (*N* = 890 doctors participating in the SUN study)

Doctors' characteristics	Adjusted ORs <sup>a</sup> (95% CI) for giving behavioral counseling								
	Mean (SD) or <i>N</i> (%)	Weight control	Nutrition	Physical activity	Alcohol reduction/avoidance	Moderate alcohol	Smoking cessation	Smoking avoidance	
Age at doctors' substudy (years)	51.7 (9.4)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.1)	
Sex									
Men	462 (51.9)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Women	428 (48.1)	1.5 (1.1–2.0)	1.9 (1.4–2.5)	1.6 (1.2–2.1)	1.9 (1.4–2.5)	1.1 (0.8–1.5)	1.1 (0.8–1.5)	1.1 (0.8–1.5)	
Post-graduate studies at baseline									
No	609 (68.4)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Yes	281 (31.6)	0.9 (0.7–1.3)	1.0 (0.7–1.4)	1.0 (0.8–1.4)	0.7 (0.5–0.9)	1.1 (0.8–1.6)	0.8 (0.6–1.1)	0.8 (0.6–1.2)	
Specialty									
Endocrinologists	16 (1.8)	6.6 (1.5–29.8)	6.5 (1.4–29.4)	5.2 (1.2–23.7)	3.3 (1.1–10.0)	1.4 (0.5–4.3)	0.7 (0.2–1.9)	0.6 (0.2–2.1)	
General practitioners	212 (23.8)	1.4 (1.0–1.9)	1.4 (1.0–1.9)	1.6 (1.1–2.2)	1.9 (1.4–2.7)	2.1 (1.5–2.9)	1.3 (0.9–1.9)	1.3 (0.9–1.8)	
Other	662 (74.4)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Actually providing clinical care									
No	127 (14.3)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Yes	763 (85.7)	0.6 (0.4–0.9)	0.6 (0.4–0.9)	0.5 (0.3–0.8)	0.7 (0.4–0.9)	0.6 (0.4–0.9)	0.7 (0.4–1.0)	0.4 (0.3–0.6)	
		Adjusted ORs <sup>a</sup> (95% CI) for time spent on behavioral counseling (>5 min)							
		Mean (SD) or <i>N</i> (%)	Weight control	Nutrition	Physical activity	Alcohol reduction/avoidance	Moderate alcohol	Smoking cessation	Smoking avoidance
Age at doctors' substudy (years)	51.7 (9.4)	1.1 (1.0–1.1)	1.0 (1.0–1.1)	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.1)	1.0 (1.0–1.1)	1.0 (1.0–1.1)	1.0 (1.0–1.1)
Sex									
Men	462 (51.9)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Women	428 (48.1)	2.3 (1.6–3.3)	2.4 (1.7–3.4)	2.1 (1.4–3.0)	2.3 (1.5–3.4)	1.4 (0.8–2.4)	1.8 (1.3–2.4)	2.1 (1.2–3.5)	
Post-graduate studies at baseline									
No	609 (68.4)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Yes	281 (31.6)	0.9 (0.6–1.3)	0.8 (0.5–1.2)	1.0 (0.7–1.5)	0.8 (0.5–1.2)	0.8 (0.4–1.4)	0.8 (0.6–1.1)	0.7 (0.4–1.3)	
Specialty									
Endocrinologists	16 (1.8)	3.0 (1.0–8.6)	4.2 (1.5–11.9)	1.1 (0.3–3.7)	–	–	–	–	
General practitioners	212 (23.8)	1.2 (0.8–1.8)	1.1 (0.7–1.6)	0.8 (0.6–1.3)	1.4 (0.9–2.1)	1.2 (0.7–2.2)	1.9 (1.3–2.6)	0.7 (0.4–1.3)	
Other	662 (74.4)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Actually providing clinical care									
No	127 (14.3)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	
Yes	763 (85.7)	1.1 (0.7–1.8)	1.3 (0.8–2.2)	1.2 (0.7–2.1)	0.5 (0.3–0.9)	0.7 (0.4–1.4)	0.8 (0.5–1.2)	0.4 (0.2–0.8)	

a: Multivariate logistic regression model including all variables in the table.

to be counseled.<sup>14</sup> Most literature shows that physicians mainly give nutritional and weight control advice to patients already overweight/obese. Different evidence from US family physicians shows that around 60–70% of them provide weight, nutrition or exercise-related counseling to overweight/obese patients, often presenting comorbidities.<sup>14–16</sup> Regarding the age of the patients receiving counseling on weight or exercise, some authors reported that preventive counseling was more common in older patients<sup>17</sup> and others show that older patients are less frequently counseled.<sup>14</sup> In any case, it seems this counseling is not a common practice among the general population and considering that these risk factors are highly preventable, physicians should give advice before patients become obese. The USPSTF recommends that 'primary care professionals individualize the decision to offer counseling promoting a healthful diet and physical activity to non-obese adults who neither have other hypertension, dyslipidemia, abnormal blood glucose levels or diabetes'. Among them, this counseling has been evidenced to have a positive effect on cardiovascular disease prevention.<sup>2</sup>

As we and other authors observed,<sup>18</sup> counseling concerning smoking cessation is more common than other behavioral counseling but further progress is still needed. The USPSTF states with an A evidence level that 'clinicians are recommended to ask all adults

about tobacco use, advise them to stop using tobacco and provide behavioral interventions'.<sup>19</sup>

Finally, with regards to alcohol, although almost 60% of doctors in our study registered alcohol consumption in the medical records, they did not counsel much about alcohol (44% counseled most of their patients on avoidance and 28% on moderate consumption). Other authors have shown more difficulties for doctors for delivering counseling on alcohol.<sup>20,21</sup> However, there is a need to identify patients at risk and there is evidence to support the recommendation to provide systematic short behavioral counseling interventions on unhealthy alcohol use.<sup>22</sup> Regarding moderate alcohol drinking, a study recently published has shown that light-to-moderate alcohol consumption among people aged 60 years and older has no statistically significant benefit on mortality compared with abstention.<sup>23</sup> Thus, doctors should better not advise to drink alcohol, particularly among the elderly.

Regarding the physicians' specialty, endocrinologists and GPs delivered more frequently counseling on weight control, nutrition, physical activity and alcohol control. For smoking cessation, general practitioners were more likely to spend longer time on this counseling than other specialists. Other authors have shown that primary care/generalist physicians are more likely to provide behavioral

**Table 2** Baseline doctors' anthropometrics and behaviors associated with their counseling practice (60–100% patients) and with their time spent on counseling ( $\geq 5$  min)

Doctors' anthropometrics and behaviors	n	Counseling (60–100% patients)		Time counseling ( $\geq 5$ min)	
		% (95% CI)	Adjusted OR (95% CI) <sup>a</sup>	% (95% CI)	Adjusted OR (95% CI) <sup>a</sup>
		Counseling on weight control <sup>b</sup>		Time counseling on weight control <sup>b</sup>	
BMI					
Normal	584	54.8 (50.7–58.8)	1 (Ref.)	20.2 (16.9–23.5)	1 (Ref.)
Overweight/obese	300	54.3 (48.7–60.0)	1.2 (0.9–1.6)	20.7 (16.1–25.3)	1.2 (0.8–1.8)
		Counseling on nutrition		Time counseling on nutrition	
Adherence to MedDiet (Trichopoulos)					
Low (0–2)	126	36.5 (28.0–45.0)	1 (Ref.)	15.9 (9.4–22.3)	1 (Ref.)
Medium (3–5)	504	50.0 (45.6–54.4)	1.7 (1.1–2.7)	21.4 (17.8–25.0)	1.3 (0.8–2.3)
High (6–9)	260	60.4 (54.4–66.4)	2.7 (1.7–4.4)	25.8 (20.4–31.1)	1.8 (0.9–3.2)
		Counseling on physical activity		Time counseling on physical activity	
Physical activity (METs, tertiles)					
Low	297	57.9 (52.3–63.6)	1 (Ref.)	15.5 (11.3–19.6)	1 (Ref.)
Moderate	297	55.5 (49.9–61.2)	1.0 (0.7–1.4)	16.8 (12.5–21.1)	1.1 (0.7–1.8)
High	296	61.1 (55.6–66.7)	1.3 (0.9–1.9)	22.2 (17.5–27.1)	1.8 (1.1–2.8)
		Counseling on alcohol avoidance		Time counseling on alcohol avoidance	
Alcohol consumption					
Abstainers/low (women: <5 g/day; men: <10 g/day)	619	46.8 (42.9–50.8)	1 (Ref.)	16.6 (13.7–19.6)	1 (Ref.)
Moderate (women: 5–25 g/day; men: 10–50 g/day)	257	37.3 (31.4–43.3)	0.7 (0.5–1.0)	10.9 (7.1–14.7)	0.6 (0.4–1.0)
High (women: >25 g/day; men: >50 g/day)	14	50.0 (20.0–80.0)	1.2 (0.4–4.0)	28.6 (1.5–55.6)	1.2 (0.3–4.4)
		Counseling on smoking cessation		Time counseling on smoking cessation	
Smoking status					
Non-smokers	518	76.2 (72.6–79.9)	1 (Ref.)	25.3 (21.5–29.0)	1 (Ref.)
Former smokers	213	75.1 (69.3–81.0)	0.9 (0.6–1.4)	30.5 (24.3–36.7)	0.9 (0.6–1.3)
Current smokers	147	61.2 (53.2–69.2)	0.5 (0.3–0.7)	28.6 (21.2–36.0)	0.8 (0.6–1.3)
		Counseling on smoking avoidance (non-smokers)		Time counseling on smoking avoidance (non-smokers)	
Smoking status					
Non-smokers	518	32.6 (28.5–36.7)	1 (Ref.)	7.7 (5.4–10.0)	1 (Ref.)
Former smokers	213	31.0 (24.7–37.2)	0.6 (0.4–0.9)	7.5 (3.9–11.1)	0.7 (0.4–1.4)
Current smokers	147	26.5 (19.3–33.7)	0.6 (0.4–0.9)	6.8 (2.7–10.9)	0.7 (0.3–1.6)

a: Multivariate logistic models adjusted for age, sex, specialty, overweight/obesity, adherence to MedDiet, physical activity, alcohol consumption and smoking status.

b: Pregnant women excluded from this analysis ( $n = 6$ ).

**Table 3** Odds ratios for providing health counseling to 60–100% of patients according to preferential prescription of medication

Adjusted OR (95% CI) <sup>a</sup> for providing counseling (60–100% patients)							
Doctors' prescription practice	Weight control	Nutrition	Physical activity	Alcohol reduction/avoidance	Moderate alcohol	Smoking cessation	Smoking avoidance
Drug prescription (more than colleagues vs. less)							
Antiobesity	4.2 (1.7–10.8)	8.3 (2.8–24.8)	4.5 (1.7–12.4)	2.8 (1.3–6.0)	3.3 (1.5–7.1)	2.6 (0.9–7.7)	1.9 (0.9–4.1)
Lipid-lowering drugs	3.4 (2.1–5.4)	2.6 (1.7–4.1)	4.0 (2.4–6.5)	2.2 (1.4–3.4)	1.7 (1.1–2.7)	3.3 (1.9–5.8)	1.3 (0.8–2.0)
Aspirin	2.7 (1.6–4.6)	4.1 (2.3–7.2)	3.9 (2.1–7.2)	2.0 (1.2–3.3)	1.8 (1.0–3.1)	5.6 (2.5–12.6)	2.1 (1.2–3.6)
Antiosteoporotic	3.0 (1.9–4.8)	2.1 (1.4–3.3)	3.7 (2.3–6.1)	1.9 (1.3–3.0)	1.2 (0.8–2.0)	2.3 (1.3–3.9)	0.8 (0.5–1.4)
Antihypertensive	2.9 (1.8–4.5)	3.8 (2.4–6.1)	4.6 (2.7–7.6)	2.1 (1.4–3.4)	1.7 (1.0–2.7)	3.2 (1.8–5.6)	1.0 (0.6–1.6)
Multivitamins	2.3 (1.6–3.3)	1.6 (1.1–2.4)	1.6 (1.1–2.3)	1.6 (1.1–2.3)	0.9 (0.6–1.3)	1.4 (0.9–2.1)	0.8 (0.6–1.3)

a: Multivariate logistic models adjusted for sex, age, specialty, overweight/obesity, adherence to MedDiet, physical activity, alcohol consumption and smoking status.

counseling and to mentor medical students on this counseling.<sup>14,24,25</sup> Primary care services are highly accessible and thus they represent an optimal opportunity to identify and counsel subjects at risk. Nevertheless, considering the high prevalence of NCD risk factors, it would be desirable to generalize behavioral counseling to most other specialties.

Another factor described to be associated with counseling are the physicians' anthropometrics. Bleich *et al.*<sup>6</sup> found among US GPs and internists that normal-BMI physicians, compared with overweight/

obese physicians, counseled more frequently their obese patients on weight loss and they also agreed that 'physicians should be role models by maintaining a healthy weight' and 'exercising regularly'. They found similar results among non-physician health professionals.<sup>26,27</sup> Surprisingly, in a study among US obstetricians/gynecologists, all overweight/obese physicians vs. 90% of the normal weight ones agreed that physicians are responsible of promoting healthy weight.<sup>5</sup> We did not observe differences on counseling on weight control or physical activity between normal weight, overweight or



obese doctors, neither for doctors reporting different physical activity levels. However, doctors highly physically active were more likely to spend more time counseling on exercise.

Regarding other health-related behaviors, we observed that physicians with better adherence to the MedDiet (29% of respondents) were significantly more likely to counsel on nutrition/diet than those with poor adherence. A study with US Internal Medicine educators and residents, found that residents' fruit and vegetable consumption was associated with higher frequency of the corresponding counseling.<sup>8</sup> There is few evidence on this association but it seems that promoting healthy dietary patterns among health professionals may facilitate nutritional counseling by doctors. Recently, adherence to the MedDiet has been evaluated among Spanish medical doctors using the PREDIMED 14-item score and unfortunately most of them did not show good adherence. This highlights the need for fostering better adherence to high-quality dietary patterns among doctors.<sup>28</sup>

Physicians who were smokers at baseline were less likely to counsel on smoking cessation, and both smokers and former smokers were significantly less likely to counsel non-smokers on smoking avoidance. Similarly, a study among GPs in Canada found that medical smokers less frequently checked the patient smoking status, advised on how to quit, and provided complete counseling coverage.<sup>29</sup>

Registering behavioral risk factors in patients' records is the first step to start behavioral counseling. Most of our clinicians registered smoking and alcohol, but registering anthropometrics was less common. Some literature has shown that among most physicians the BMI is used for obesity screening,<sup>30</sup> but there are not consistent results. In a Swiss study including physicians and nurses, less than 20% calculated the BMI for all patients and one out of three did not know how to calculate BMI, neither the cut-offs for overweight or obesity. Errors among physicians that try to recognize overweight and obese patients by simple visual identification have also been described.<sup>31</sup> There is a high prevalence of doctors that have never received any education about obesity<sup>32</sup> and its documentation is even significantly different for non-obese and obese physicians<sup>33</sup> or for doctors and residents.<sup>34</sup> Thus, all doctors need to be first conscious of the relevance of registering at least patients' weight and height for the calculation of BMI for an adequate prevention and control of obesity and related diseases.

We analyzed the association between prescribing practices and counseling and we unexpectedly found that doctors prescribing certain drugs more frequently than colleagues were more likely to do behavioral counseling than those prescribing less. This could be due to the fact that at the same time they are informing about medication they additionally counsel about some behaviors. Bleich *et al.*<sup>6</sup> found that overweight/obese physicians compared with those with a normal BMI were significantly more self-efficacious for prescribing weight-loss drugs. However, another study showed that obese providers prescribed less frequently.<sup>35</sup> Although the use of pharmacotherapy for NCDs risk factors has increased, healthcare professionals need to focus first on all the risk factors that can be efficiently prevented through counseling before thinking on other solutions which are more costly and less effective in the long time.

One of the main barriers physicians find for behavioral counseling is the lack of time.<sup>5,15,16,36</sup> In the study previously mentioned that evaluated MedDiet adherence among Spanish physicians, more than 60% stated that 'they could invest 5 min of their time to recommend MedDiet'.<sup>28</sup> Among our participants, we found that 90% reported spending more than 5 min per patient and 69% more than 10 min and spending more time is associated with counseling<sup>14</sup> and as explained before, we observed that physicians' own behaviors frequently are associated with spending more time on counseling.

Another barrier for doing counseling is that physicians often perceive they don't have an adequate training.<sup>5,8,27,32,36</sup> They are in a

unique position to provide behavioral counseling, therefore, a new challenge for medical schools is to include more nutritional, behavioral and communication education in the curricula, considering practical and interprofessional activities, as well as the use of new technologies and methodologies.<sup>5-7,37</sup>

The present study has some limitations. First, we acknowledge the limitation inherent to a low response rate (37%). Compared with the main questionnaires in the SUN cohort, which are needed to ensure a high long-time retention, the questionnaire in this ancillary substudy was not repeatedly administered and was available only on-line. Furthermore, the nature of the questions in this substudy are not intrinsically included in the main aims of the original cohort and they are probably less appealing to doctors. Doctors may feel less comfortable in answering questions directly or indirectly assessing their level of professionalism, than answering only about their own lifestyle aspects. Other studies on physicians' counseling or prescribing behaviors have shown similar response rates.<sup>38,39</sup> In the recent data from the Nurses' Health Study, the investigators of that cohort stated that they obtained 'a response rate of approximately 30% for the first hand-addressed mailing and approximately 15% for the second and final mailing after 6-7 regular mailings without a response'.<sup>40</sup> Secondly, we evaluated the physicians' baseline characteristics not taking into account that changes in their sociodemographics, anthropometrics or behaviors may have occurred throughout the follow-up. Thirdly, we didn't gather information about the characteristics of the patients our physicians counsel, which could modify the frequency and content of counseling. Finally, we included physicians not attending patients at study time to whom we asked what they would have done if they were attending.

Despite these limitations, our study has several strengths. First, there is scarce literature that has evaluated the association between physicians own characteristics and behaviors and their counseling practice, which is really useful to design strategies to improve behavioral change counseling. Second, all physicians included come from the SUN study, a well-known cohort that collects abundant information regarding many NCDs and risk factors related. Finally, we gathered information not only about counseling content, but also about the time on counseling and about the prescribing practice, which often can be a competitive factor for focusing on counseling.

In conclusion, we found that personal healthy nutritional and lifestyle behaviors among medical doctors are associated with better attention to preventive medical care. Therefore, we need to achieve behavioral changes among physicians and improve health education and consequently improve the corresponding behavioral counseling.<sup>24</sup> The consideration of the different individual and community levels as well as the involvement of the different sectors is necessary for a sustainable behavior change.<sup>1</sup>

The Acknowledgements and additional references can be found in the [Supplementary Material](#).

## Supplementary data

[Supplementary data](#) are available at *EURPUB* online.

## Funding

The SUN Project has received funding from the Spanish Government-Instituto de Salud Carlos III and the European Regional Development Fund (FEDER) (RD 06/0045, CIBER-ÖBN, PI10/02658, PI10/02293, PI13/00615, PI14/01668, PI14/01798, PI14/01764, PI17/01795 and G03/140), the Navarra Regional Government (27/2011, 45/2011, 122/2014), and the University of Navarra.

*Conflicts of interest:* None declared.

## Key points

- Doctors mainly counseled patients on smoking cessation, physical activity and weight.
- Female doctors were more likely to counsel on weight, nutrition, physical activity and alcohol.
- Endocrinologists and General Physicians counseled more frequently on weight, nutrition, exercise and alcohol control than other specialists.
- Physicians adherent to MedDiet counseled more on nutrition, and physically active doctors spent more time counseling on exercise.
- Smoker and former smoker physicians were less likely to counsel on smoking avoidance.
- Doctors prescribing certain drugs were more likely to do behavioral counseling than those prescribing less.

## References

- World Health Organization. Noncommunicable diseases. Fact Sheet. Available at: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases> (1 June 2018, date last accessed).
- US Preventive Services Task Force, Grossman DC, Bibbins-Domingo K, Curry SJ, et al. Behavioral counseling to promote a healthful diet and physical activity for cardiovascular disease prevention in adults without cardiovascular risk factors: US preventive services task force recommendation statement. *JAMA* 2017;318:167–74.
- O'Connor EA, Perdue LA, Senger CA, et al. Screening and behavioral counseling interventions to reduce unhealthy alcohol use in adolescents and adults: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA* 2018;320:1910–28.
- Palakodeti S, Uratsu CS, Schmittiel JA, Grant RW. Changes in physical activity among adults with diabetes: a longitudinal cohort study of inactive patients with Type 2 diabetes who become physically active. *Diabet Med* 2015;32:1051–7.
- Huepenbecker SP, Wan L, Leon A, et al. Obesity counseling in obstetrics and gynecology: provider perceptions and barriers. *Gynecol Oncol Rep* 2019;27:31–4.
- Bleich SN, Bennett WL, Gudzone KA, Cooper LA. Impact of physician BMI on obesity care and beliefs. *Obesity (Silver Spring)* 2012;20:999–1005.
- Aspry KE, Van Horn L, Carson JAS, et al.; American Heart Association Nutrition Committee of the Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; Council on Cardiovascular Radiology and Intervention; and Stroke Council. Medical nutrition education, training, and competencies to advance guideline-based diet counseling by physicians: a science advisory from the American Heart Association. *Circulation* 2018;137:e821–41.
- Khandelwal S, Zemore SE, Hemmerling A. Nutrition education in internal medicine residency programs and predictors of residents' dietary counseling practices. *J Med Educ Curric Dev* 2018;5:2382120518763360.
- Carlos S, De La Fuente-Arrillaga C, Bes-Rastrollo M, et al. Mediterranean diet and health outcomes in the SUN cohort. *Nutrients* 2018;10:E439.
- De la Fuente-Arrillaga C, Ruiz ZV, Bes-Rastrollo M, et al. Reproducibility of an FFQ validated in Spain. *Public Health Nutr* 2010;13:1364–72.
- Martin-Moreno JM, Boyle P, Gorgojo L, et al. Development and validation of a food frequency questionnaire in Spain. *Int J Epidemiol* 1993;22:512–9.
- Trichopoulou A, Costacou T, Bamia C, Trichopoulos D. Adherence to a Mediterranean diet and survival in a Greek population. *N Engl J Med* 2003;348:2595–6.
- Tsugawa Y, Jena AB, Figueroa JF, et al. Comparison of hospital mortality and readmission rates for medicare patients treated by male vs female physicians. *JAMA Intern Med* 2017;177:206–13.
- Goldberg DM, Cho BY, Lin HC. Factors influencing U.S. physicians' decision to provide behavioral counseling. *Prev Med* 2019;119:70–6.
- Nair D, Hart A. Family physicians' perspectives on their weight loss nutrition counseling in a high obesity prevalence area. *J Am Board Fam Med* 2018;31:522–8.
- Petrin C, Kahan S, Turner M, et al. Current attitudes and practices of obesity counselling by health care providers. *Obes Res Clin Pract* 2017;11:352–9.
- Tucker CM, Williams JL, Wippold GM, et al. Views of diverse primary care patients on the roles of healthcare providers and staff and the influence of other variables in their weight management. *Clin Obes* 2018;8:11–20.
- Holla N, Brantley E, Ku L. Physicians' recommendations to medicaid patients about tobacco cessation. *Am J Prev Med* 2018;55:762–9.
- U.S. Preventive Services Task Force. Final Recommendation Statement. Tobacco Smoking Cessation in Adults, Including Pregnant Women: Behavioral and Pharmacotherapy Interventions. 2017. <https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/tobacco-use-in-adults-and-pregnant-women-counseling-and-interventions1> (March 2019, date last accessed).
- O'Donnell A, Kaner E. Are brief alcohol interventions adequately embedded in UK primary care? A qualitative study utilising normalisation process theory. *Int J Environ Res Public Health* 2017;14:E350.
- Lopez Santi R, Haseeb S, Alexander B, et al. Attitudes and recommendations of physicians towards alcohol consumption and cardiovascular health: a perspective from Argentina. *Diseases* 2018;6:E77.
- US Preventive Services Task Force, Curry SJ, Krist AH, Owens DK, et al. Screening and behavioral counseling interventions to reduce unhealthy alcohol use in adolescents and adults: US Preventive Services Task Force Recommendation Statement. *JAMA* 2018;320:1899–909.
- Ortolá R, García-Esquinas E, López-García E, et al. Alcohol consumption and all-cause mortality in older adults in Spain: an analysis accounting for the main methodological issues. *Addiction* 2019;114:59–68.
- Antognoli EL, Seeholzer EL, Gullett H, et al. Primary care resident training for obesity, nutrition, and physical activity counseling: a mixed-methods study. *Health Promot Pract* 2017;18:672–80.
- Geller AC, Ockene JK, Kulkarni M, et al. Students' report of preceptor weight management counseling at eight U.S. medical schools. *Am J Prev Med* 2018;55:e139–45.
- Bleich SN, Bandara S, Bennett WL, et al. Impact of non-physician health professionals' BMI on obesity care and beliefs. *Obesity (Silver Spring)* 2014;22:2476–80.
- Bleich SN, Bandara S, Bennett WL, et al. U.S. health professionals' views on obesity care, training, and self-efficacy. *Am J Prev Med* 2015;48:411–8.
- Sentenach-Carbo A, Battle C, Franquesa M, et al. Adherence of Spanish primary physicians and clinical practise to the Mediterranean diet. *Eur J Clin Nutr* 2019; 72(Suppl 1):92–8.
- Meshefedjian GA, Gervais A, Tremblay M, et al. Physician smoking status may influence cessation counseling practices. *Can J Public Health* 2010;101:290–3.
- Glauser TA, Roepke N, Stevenin B, et al. Physician knowledge about and perceptions of obesity management. *Obes Res Clin Pract* 2015;9:573–83.
- Robinson E, Parretti H, Aveyard P. Visual identification of obesity by healthcare professionals: an experimental study of trainee and qualified GPs. *Br J Gen Pract* 2014;64:e703–8.
- Bucher Della Torre S, Courvoisier DS, Saldarriaga A, et al. Knowledge, attitudes, representations and declared practices of nurses and physicians about obesity in a university hospital: training is essential. *Clin Obes* 2018;8:122–30.
- Berry AC, Berry NA, Myers TS, et al. Physician body mass index and bias toward obesity documentation patterns. *Ochsner J* 2018;18:66–71.
- Mkhatshwa VB, Ogunbanjo GA, Mabuza LH. Knowledge, attitudes and management skills of medical practitioners regarding weight management. *Afr J Prim Health Care Fam Med* 2016;8:e1–9.
- Petrin C, Kahan S, Turner M, et al. Current practices of obesity pharmacotherapy, bariatric surgery referral and coding for counselling by healthcare professionals. *Obes Sci Pract* 2016;2:266–71.
- Whitaker KM, Wilcox S, Liu J, et al. Patient and provider perceptions of weight gain, physical activity, and nutrition counseling during pregnancy: a qualitative study. *Women's Health Issues* 2016;26:116–22.
- Eaton CB, Hartman SJ, Perzanowski E, et al. A randomized clinical trial of a tailored lifestyle intervention for obese, sedentary, primary care patients. *Ann Fam Med* 2016;14:311–9.
- Salm F, Schneider S, Schmücker K; RAI-Study Group. Antibiotic prescribing behavior among general practitioners—a questionnaire-based study in Germany. *BMC Infect Dis* 2018;18:208.
- Petrella RJ, Lattanzio CN, Overend TJ. Physical activity counseling and prescription among Canadian primary care physicians. *Arch Intern Med* 2007;167:1774–81.
- Bao Y, Bertoia ML, Lenart EB, et al. Origin, methods, and evolution of the three nurses' health studies. *Am J Public Health* 2016;106:1573–81.