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Patient-reported reasons for and predictors of noncompliance with compression stockings in a randomized trial of stockings to prevent postthrombotic syndrome

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Abstract

Introduction: Elastic compression stockings (ECSs) are used to treat symptoms of venous insufficiency. However, lack of patient compliance can limit their effectiveness. In a secondary analysis of the SOX Trial, a randomized trial of active vs. placebo ECSs worn for 2 years to prevent postthrombotic syndrome after deep vein thrombosis, we aimed to describe patient-reported reasons for nondaily use of ECS and to identify predictors of noncompliance during follow-up.

Methods: At each follow-up visit of the SOX Trial, patients were asked how many days per week they wore study stockings, and if not worn daily, to specify the reason(s). Reasons for nondaily use of ECSs were tabulated. Multiple logistic regression modeling was used to identify predictors of stocking noncompliance during follow-up (defined as use <3 days per week).

Results: Among the 776 patients who attended at least 1 follow-up visit, daily use of stockings at each visit was similar in the active and placebo ECS groups. Reasons for nondaily use of stockings was most frequently related to aversive aspects of stockings (~three-fourths of patients) and less often related to patient behaviors (~one-fourth of patients). In multivariate analyses, behavior-related and aversive aspect–related reasons for nondaily use of ECSs at the 1-month visit were significant predictors of noncompliance during follow-up (odds ratio [OR] = 4.41 [95% confidence interval, 2.12-9.17] and OR = 3.99 [2.62-6.08], respectively).

Conclusions: Aversive aspects of ECSs and patient behaviors are important reasons for noncompliance. Improving the appeal and tolerability of ECS and education directed at modifying patient behaviors may improve compliance.

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KEYWORDS
adherence, compliance, compression stockings, deep vein thrombosis, postthrombotic syndrome

Essentials

- Noncompliance with elastic compression stockings may limit their therapeutic efficacy in people with chronic venous insufficiency.
- We aimed to identify reasons for and predictors of stocking noncompliance in the SOX Trial population.
- Aversive aspects of compression stockings and patient behaviors were shown to be important reasons for noncompliance.
- Improving the appeal and tolerability of compression stockings and education directed at modifying patient behaviors may improve compliance.

1 | INTRODUCTION

Elastic compression stockings (ECSs) reduce venous hypertension and venous stasis in the lower extremities, and are frequently used to prevent and treat venous insufficiency, a prevalent and costly chronic condition.[1,2] However, many patients prescribed ECSs do not fill their prescription[3] or fill their prescription but do not wear their ECSs.[4] Thus, lack of compliance might be an important limitation to achieving optimal effectiveness of ECSs.

Overall, compliance with ECSs has been inadequately reported in the literature, with nearly half of studies either not reporting compliance or poorly describing it.[4] However, in one study, noncompliance to ECSs was reported in two-thirds of patients,[5] and a recent systematic review of multiple studies of ECSs reported that one-third of patients were noncompliant.[4] Understanding reasons for patients' noncompliance with ECSs could lead to improvement in the design and use of compression stockings for optimal patient benefit.

The SOX Trial assessed the effectiveness of ECSs to prevent the postthrombotic syndrome (PTS) after deep vein thrombosis (DVT).[6] During the trial, detailed information on use of study stockings and reasons for nonuse was collected but has not yet been reported in full. In the current analysis, we aimed to describe patient-reported reasons for nonuse of ECSs in the SOX Trial population and to identify predictors of noncompliance.

2 | METHODS

The SOX Trial was a multicenter randomized placebo controlled trial (n = 803) of active ECSs vs. placebo ECSs worn for 2 years after a first, symptomatic, proximal DVT to prevent the development of PTS.[6] Exclusion criteria for the SOX Trial included contraindication to the use of ECSs (eg, allergy or severe arterial claudication), an expected life span of <6 months, geographic inaccessibility precluding return for follow-up visits, inability to apply stockings, or received thrombolytic therapy for the initial treatment of acute DVT.[6]

Active ECSs were knee-length 30 to -40 mm Hg (class II) graduated ECSs; placebo ECSs were manufactured to look identical to active ECSs but lacked therapeutic compression. Both active ECSs and placebo ECSs were provided free of charge to study participants and replaced every 6 months. Sizing was based on leg measurements performed by trained study nurses at each study visit.

Patients were asked to wear the study stockings on the DVT-affected leg daily for up to 24 months, and attended follow-up visits at 1, 6, 12, 18, and 24 months. At each follow-up visit, patients were asked how many days per week they wore the study stockings (response options: every day; 3-6 days per week; 1-2 days per week; less than once per week) and, if not worn daily, were prompted to specify the reason(s) (response options: difficult to put on; difficult to remove; not helpful; make symptoms worse; or alternative reason specified by patient). Reasons were grouped into 4 broad categories, as described below.

Reasons for nondaily use of ECSs were tabulated. As in the main SOX Trial paper,[6] overall compliance with ECSs over follow-up ("ECS compliers") was defined as ECSs worn for ≥3 days per week.

2.1 | Statistical analysis

We summarized demographic and clinical characteristics of study subjects as means and standard deviations or proportions, as appropriate. Reasons for not wearing stockings daily were compared in the active ECS and placebo ECS groups using the chi-square or Fisher exact test, as appropriate. We used multiple logistic regression modeling to examine the association between being an ECS noncomplier and age, sex, body mass index (BMI), cigarette smoking, level of education, Villalta score at baseline (an indicator of severity of acute DVT symptoms/signs), study intervention group (ie, active vs. placebo ECSs), and category of reason at the 1-month visit for not wearing study stockings daily. In the regression model, all endorsed or specified reasons for not wearing study stockings daily were categorized as "behavior-related," "aversive aspects of stockings," "other reasons," or "no reason provided" (reference category). "Other reasons" were those outside the patient's control, for example, delayed delivery of study stockings or temporary prescription of nonstudy stockings by the patient's treating physician. As a sensitivity analysis, we repeated the multiple logistic regression after removing patients who had "other reasons" for not wearing study stockings daily.

We performed all statistical analyses using SAS Software (version 9.4, SAS Institute Inc, Cary, NC, USA).

3 | RESULTS

Among the 776 study patients who had at least 1 follow-up visit, 61% were male, mean age was 55.1 years, and mean BMI was 29.0 kg/m^2. The most proximal extent of DVT was femoral or popliteal vein in 62% of patients and iliac or common femoral vein in 38% of patients. Additional baseline characteristics are shown in Table 1.

As was reported in the main paper, use of study stockings at each visit was similar in the active ECS and placebo ECS groups. Overall, at 1 month, 96.1% of patients reported wearing their stockings, and, of these, 86.4% used them for ≥3 days per week; this decreased to 69.1% and 55.6%, respectively, by the 24-month visit. When used, stockings were worn for about 10 to 11 hours per day. In terms of daily use of ECSs, shown in Table 2, similar proportions of patients in the active and placebo ECS groups at each visit reported wearing their stockings daily, except for the 1-month visit, at which significantly more patients in the placebo ECS group than active ECS group wore their stockings daily (81% vs. 73%; P = 0.01). Daily use of ECSs decreased over time in both groups, from over 77% at the 1-month visit to just over 54% at the 24-month visit.

Table 2 also shows the patient-reported reasons for nondaily use of ECSs by study visit and by treatment group. The most common reason endorsed at all study visits among the options "difficult to put on," "difficult to remove," "not helpful," or "make symptoms worse" was "difficult to put on," which was endorsed more frequently by patients randomized to active ECSs than placebo ECSs. Among patients who selected "alternative reason" for nondaily use of study stockings, the reasons specified fell into 3 main thematic categories (Table 3; Figure 1): (1) aversive aspects of ECSs (uncomfortable or

TABLE 1 Baseline characteristics of study population

	Whole population	Active ECSs	Placebo ECSs
N	776	394	382
Age, y			
Mean ± SD	55.1 ± 15.6	55.3 ± 15.3	54.8 ± 15.9
<40	130 (16.8)	64 (16.2)	66 (17.3)
40-65	426 (54.9)	215 (54.6)	211 (55.2)
>65	220 (28.4)	115 (29.2)	105 (27.5)
Male sex	470 (60.6)	248 (62.9)	222 (58.1)
Body mass index, kg/m^2			
Mean ± SD	29.0 ± 6.1	29.0 ± 6.1	28.9 ± 6.1
<25	203 (26.2)	102 (25.9)	101 (26.4)
25-30	297 (38.3)	148 (37.6)	149 (39.0)
≥30	276 (35.6)	144 (36.5)	132 (34.6)
Education			
No school or primary only	70 (9.0)	34 (8.6)	36 (9.4)
High school only	242 (31.2)	119 (30.2)	123 (32.2)
Some college/university	235 (30.3)	122 (31.0)	113 (29.6)
University graduate	229 (29.5)	119 (30.2)	110 (28.8)
Smoking status			
Nonsmoker	630 (81.2)	321 (81.5)	309 (80.9)
Smoker	146 (18.8)	73 (18.5)	73 (19.1)
Anatomical extent of DVT			
Femoral or popliteal vein	478 (61.6)	246 (62.4)	232 (60.7)
Common femoral or iliac vein	298 (38.4)	148 (37.6)	150 (39.3)
Villalta score at baseline			
Mean ± SD	8.4 ± 4.6	8.3 ± 4.4	8.6 ± 4.8
None (score < 5)	164 (21.1)	83 (21.1)	81 (21.2)
Mild (5-9)	308 (39.7)	167 (42.4)	141 (36.9)
Moderate (10-14)	221 (28.5)	110 (27.9)	111 (29.1)
Severe (>14 or ulcer)	83 (10.7)	34 (8.6)	49 (12.8)

Note: Data shown in table are n (%) unless indicated otherwise.

DVT, deep vein thrombosis; ECSs, elastic compression stockings; SD, standard deviation.

TABLE 2 Reasons provided by patients for not wearing study stockings daily

	Whole population	Active ECSs	Placebo ECSs	*P* value
1-month visit				
Wear stockings every day	564 (76.8)	273 (73.0)	291 (80.8)	.01
Do not wear stockings every day	170 (23.2)	101 (27.0)	69 (19.2)	
Reasons[a] not worn daily:				
Difficult to put on	45 (26.5)	37 (36.6)	8 (11.6)	.0003
Difficult to remove	13 (7.6)	9 (8.9)	4 (5.8)	.45
Not helpful	6 (3.5)	2 (2.0)	4 (5.8)	.22
Makes symptoms worse	11 (6.5)	8 (7.9)	3 (4.3)	.53
Alternative reason	119 (70.0)	61 (60.4)	58 (84.1)	.0009
6-month visit				
Wear stockings every day	376 (64.7)	192 (64.0)	184 (65.5)	.71
Do not wear stockings every day	205 (35.3)	108 (36.0)	97 (34.5)	
Reasons not worn daily:				
Difficult to put on	28 (13.7)	20 (18.5)	8 (8.2)	.03
Difficult to remove	11 (5.4)	8 (7.4)	3 (3.1)	.17
Not helpful	6 (2.9)	1 (0.9)	5 (5.2)	.10
Makes symptoms worse	9 (4.4)	4 (3.7)	5 (5.2)	.74
Alternative reason	168 (82.0)	84 (77.8)	84 (86.6)	.10
12-month visit				
Wear stockings every day	293 (59.4)	136 (55.5)	157 (63.3)	.08
Do not wear stockings every day	200 (40.6)	109 (44.5)	91 (36.7)	
Reasons not worn daily				
Difficult to put on	24 (12.0)	18 (16.5)	6 (6.6)	.03
Difficult to remove	8 (4.0)	7 (6.4)	1 (1.1)	.07
Not helpful	17 (8.5)	11 (10.1)	6 (6.6)	.38
Makes symptoms worse	8 (4.0)	2 (1.8)	6 (6.6)	.14
Alternative reason	159 (79.5)	83 (76.1)	76 (83.5)	.20
18-month visit				
Wear stockings every day	236 (56.3)	113 (55.1)	123 (57.5)	.63
Do not wear stockings every day	183 (43.7)	92 (44.9)	91 (42.5)	
Reasons not worn daily:				
Difficult to put on	26 (14.2)	19 (20.7)	7 (7.7)	.01
Difficult to remove	5 (2.7)	4 (4.3)	1 (1.1)	.37
Not helpful	17 (9.3)	7 (7.6)	10 (11.0)	.43
Makes symptoms worse	6 (3.3)	3 (3.3)	3 (3.3)	>.99
Alternative reason	144 (78.7)	73 (79.3)	71 (78.0)	.83
24-month visit				
Wear stockings every day	205 (54.2)	102 (53.1)	103 (55.4)	.66
Do not wear stockings every day	173 (45.8)	90 (46.9)	83 (44.6)	
Reasons not worn daily:				
Difficult to put on	27 (15.6)	17 (18.9)	10 (12.0)	.22
Difficult to remove	8 (4.6)	7 (7.8)	1 (1.2)	.07
Not helpful	26 (15.0)	12 (13.3)	14 (16.9)	.52
Makes symptoms worse	4 (2.3)	3 (3.3)	1 (1.2)	.62
Alternative reason	127 (73.4)	64 (71.1)	63 (75.9)	.48

Note: Data shown in table are n (%) unless indicated otherwise.

ECSs, elastic compression stockings.

[a]Reasons may add up to more than 100%, as patients were asked to tick all that apply.

irritating or worsen symptoms, too hot, cause itching or rash, takes too much time to put on, too difficult to apply, unaesthetic, they don't help) in approximately three-fourths of patients; (2) patient behavior related (too lazy or can't be bothered, forgot, need a break, only wears at certain times, patient preference not to wear them) in approximately one-fourth of patients, and "other reason" in a minority of patients.

Overall, 448 (57.7%) patients were categorized as being ECS compliers during their participation in the trial, and 328 (42.3%) were categorized as ECS noncompliers. In multivariable analysis, providing "behavior-related" or "aversive aspects"–related reasons for nondaily use of ECSs were significant predictors of being an ECS noncomplier during follow-up (odds ratio [OR], 4.41 [95% confidence interval [CI], 2.12-9.17] and 3.99 [2.62-6.08], respectively; reference category: no reason provided) (Figure 2). Female sex, cigarette smoking, and lower BMI also tended to predict being an ECS noncomplier (ORs, $0.05 < P < 0.1$) (Figure 2). Of interest, baseline Villalta score did not predict being an ECS complier during study follow-up (OR, 1.00 [0.97-1.04]) and was not associated with daily vs. nondaily use of ECS at each study visit (data not shown).

In sensitivity analysis, after removing the 6 patients who answered "other reasons" for nondaily use of ECSs (delay in ECS delivery, 5 patients; temporary prescription of nonstudy stockings, 1 patient), the ORs and 95% CIs of the remaining variables in the model remained substantively the same (data not shown).

TABLE 3 Principal reason for nondaily use of ECSs at each study visit, in the whole study population and by intervention group

	Principal reason for nondaily use														
	Overall					Active ECSs					Placebo ECSs				
	M1	M6	M12	M18	M24	M1	M6	M12	M18	M24	M1	M6	M12	M18	M24
Total N	170	205	197	180	172	102	108	108	90	90	68	97	89	90	82
Aversive aspects of ECSs (%)															
Uncomfortable, irritating, worsen symptoms	27.1	21.0	13.2	10.6	11.0	29.4	19.4	11.1	13.3	12.2	23.5	22.7	15.7	7.8	9.8
Stocking too hot	5.3	15.6	15.2	17.2	15.7	5.9	13.9	13.9	12.2	18.9	4.4	17.5	16.9	22.2	12.2
Causes itching or rash	4.1	2.4	1.5	2.2	1.7	2.9	0.9	1.9	2.2	1.1	5.9	4.1	1.1	2.2	2.4
Take too much time to put on	3.5	3.9	5.1	3.9	3.5	2.9	4.6	4.6	1.1	1.1	4.4	3.1	5.6	6.7	6.1
Too difficult to apply	28.2	16.1	12.7	15.6	16.3	39.2	22.2	17.6	21.1	20.0	11.8	9.3	6.7	10.0	12.2
Unaesthetic	2.4	7.8	4.6	6.1	5.2	2.9	7.4	5.6	7.8	4.4	1.5	8.2	3.4	4.4	6.1
They don't help	4.7	5.9	10.7	12.2	18.6	2.0	2.8	11.1	11.1	15.6	8.8	9.3	10.1	13.3	22.0
Total	**75.3**	**72.7**	**63.0**	**67.8**	**72.0**	**85.2**	**71.2**	**65.8**	**68.8**	**73.3**	**60.3**	**74.2**	**59.5**	**66.6**	**70.8**
Patient behavior related (%)															
Too lazy to put on, can't be bothered	4.1	2.4	3.0	2.8	5.2	1.0	2.8	2.8	3.3	2.2	8.8	2.1	3.4	2.2	8.5
Forgets	5.3	7.3	12.2	12.8	8.1	2.9	6.5	11.1	8.9	8.9	8.8	8.2	13.5	16.7	7.3
Need a break	7.1	5.4	9.6	4.4	3.5	5.9	7.4	10.2	6.7	5.6	8.8	3.1	9.0	2.2	1.2
Only wears at certain times, eg, physical activity, working, standing	1.8	4.4	2.5	5.6	2.3	1.0	3.7	2.8	4.4	3.3	2.9	5.2	2.2	6.7	1.2
Patient preference not to wear them (not stated, or has other health issues)	2.9	6.8	8.6	5.0	8.1	2.0	6.5	6.5	5.6	5.6	4.4	7.2	11.2	4.4	11.0
Total	**21.2**	**26.3**	**35.9**	**30.6**	**27.2**	**12.8**	**26.9**	**33.4**	**28.9**	**25.6**	**33.7**	**25.8**	**39.3**	**32.2**	**29.2**
Other															
Delay in receiving study stockings	2.9	0	0	0.6	0	2.0	0	0	0	0	4.4	0	0	1.1	0
Temporary prescription of nonstudy stockings by treating physician	0.6	1.0	1.0	1.1	0.6	0	1.9	0.9	2.2	1.1	1.5	0	1.1	0	0
Total	**3.5**	**1.0**	**1.0**	**1.7**	**0.6**	**2.0**	**1.9**	**0.9**	**2.2**	**1.1**	**5.9**	**0**	**1.1**	**1.1**	**0**

Note: M, month of follow-up.

ECSs, elastic compression stockings.

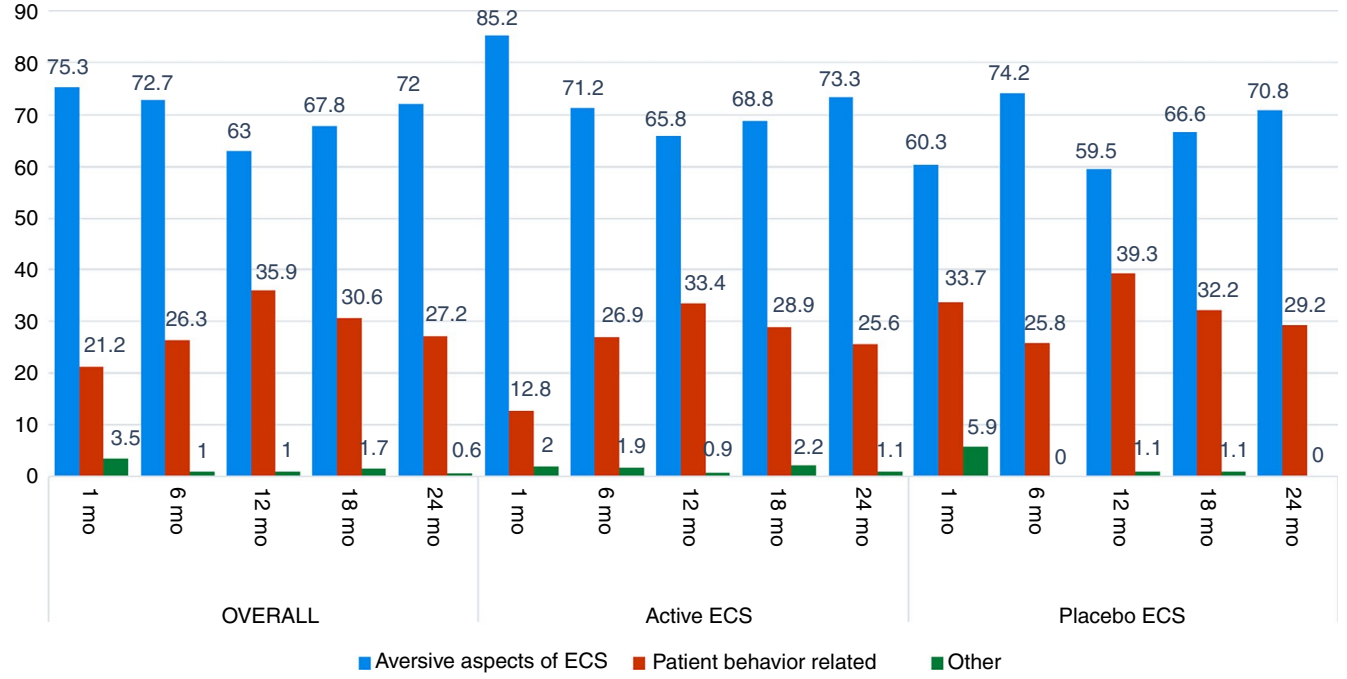

FIGURE 1 Category of principal reason for nondaily use of ECSs at each study visit, in whole study population and by intervention group (*Y* axis represents %). ECSs, elastic compression stockings

4 | DISCUSSION

During the SOX Trial, investigators obtained information from study participants regarding their use of assigned ECSs at each study visit. In this article, we report detailed analyses on the use of study stockings and reasons for and predictors of noncompliance. Although overall compliance during the study was similar between the 2 groups at 2 years, more patients assigned to placebo ECSs reported using their ECSs daily at the 1-month visit than those assigned to active ECSs. This may relate to greater ease in applying and removing a stocking without therapeutic compression. This difference was no longer apparent after 1 month, perhaps because those assigned to active ECSs became more used to applying their stockings.

Daily use of ECSs decreased over the 2-year study period in both the active and placebo ECS groups, to just over 50% at 2 years. A large observational study by Raju et al[5] examined compliance with ECSs among 3144 patients referred for chronic venous insufficiency to a specialized tertiary care practice. Only 21% of patients wore stockings daily, 12% wore them most days, and 4% used them less often. The remaining 63% of patients did not use stockings at all. Patients with a history of prior DVT were more compliant than those without (50% vs. 35%) ($P < 0.0001$), which aligns with the higher compliance noted in our study, in whom all participants were post-DVT. In Raju's study,[5] compliance increased with duration of symptoms, with 25% compliance among patients with symptoms for <1 year, and 40% among patients with symptoms for 6 to 10 years. Thus, patient compliance may be influenced by symptomatology, with greater symptom burden promoting better compliance. The opposing trends in compliance over time observed in our study vs. Raju's study likely reflect the 2 different study populations, as patients with DVT are more often symptomatic initially, then symptoms decrease with time (unless complicated by PTS), whereas symptoms of chronic venous insufficiency tend to worsen with time, especially if left untreated.

More active ECS patients than placebo ECS patients in our study identified "difficult to put on" as the reason for less than daily usage at multiple follow-up visits (eg, 1 month, 36.6% vs. 11.6%; 6 months, 18.5% vs. 8.2%; 12 months, 16.5% vs. 6.6%; 24 months, 18.9% vs. 12.0%). "Alternative" reasons for nondaily use of ECSs were grouped into the common themes of aversive aspects of ECSs and patient behavior-related reasons and then pooled with similarly themed reasons made available on the questionnaire. Aversive aspects of ECSs were the most frequently cited reasons for nondaily use of ECSs, followed by patient behavior-related reasons (75.3% and 21.2%, respectively, at 1-month visit). This finding is in line with a summation analysis that evaluated compression stocking compliance; among the 18 studies reviewed that described reasons for noncompliance, all cited either excessive tightness, pain, or intolerance to heat with use of stockings.[4]

In this study, the main predictors of being an ECS noncomplier during study follow-up were citing aversive or behavior-related reasons for not wearing ECS daily, as reported at the 1-month visit. This reinforces the importance of health care providers' querying patients about their adherence to prescribed ECSs, exploring reasons for nonadherence, and providing patient education, especially in the weeks following prescription of ECSs. Patients who do not provide a specific reason at 1 month may represent a group that is undecided regarding their compliance and therefore potentially more likely to respond to an educational intervention by the clinician.

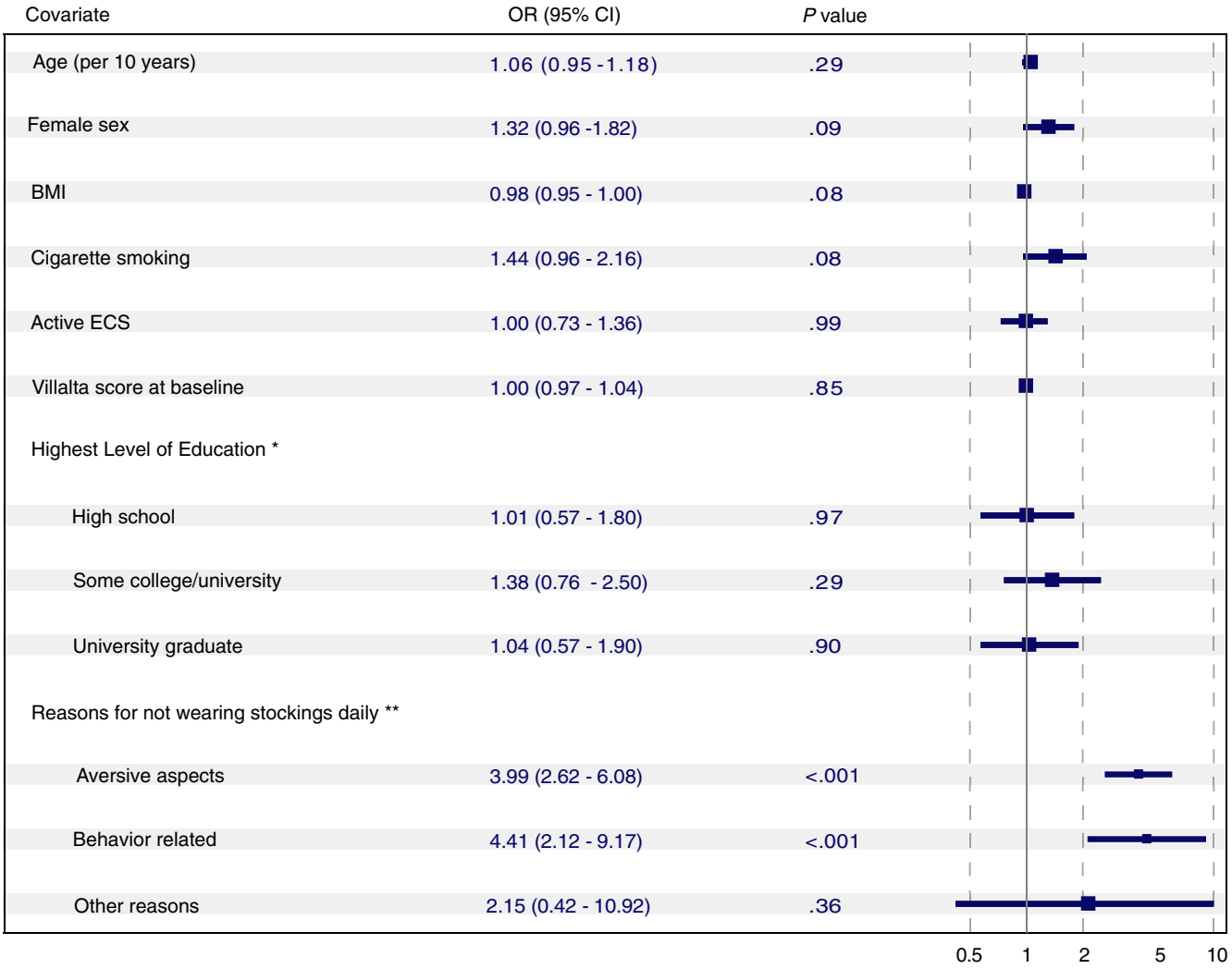

FIGURE 2 Multiple logistic regression analysis of predictors of being an ECS noncomplier.[#] Note: The model was adjusted for all variables shown. [#]Being an "ECS complier" during the SOX Trial was defined a priori as patients who reported any stocking use on 3 or more out of 5 visits (ie, 1, 6, 12, 18, 24 months) and at these visits reported using stockings ≥3 days per week, for patients who attended all 5 study follow-up visits, and patients who reported any stocking use on ≥2 visits and at these visits reported using stockings ≥3 days per week, for patients who attended <5 follow-up visits. All other patients, as well as patients with 0 or 1 attended follow-up visit, were considered ECS noncompliers. *Reference category: No school or primary school only. **We categorized the reasons provided for not wearing stockings daily at the 1-month follow-up visit (ie, information from Tables 2 and 3) into 1 of 4 categories: aversive aspects of ECS (n = 128), behavior related (n = 36), other reason (n = 6), or no reason provided (n = 594) (reference category). BMI, body mass index; ECSs, elastic compression stockings

We found that being female, a smoker, and having lower BMI were modest independent predictors of ECS noncompliance during study follow-up. It is possible that women were less compliant than men because of the aesthetic concerns that ECSs may present. However, in contrast to our study, women have not previously been shown to be less compliant with ECSs, with the largest study (3144 patients) reporting similar compliance in men and women (39% and 38%, respectively).[5] In a smaller study of 84 patients assigned ECSs after DVT for the prevention of PTS, men were found to be 4 times less compliant than women, albeit with a wide CI (OR, 4.1 [CI, 1.0-16.0]).[7] The authors did not speculate as to the reasons for sex differences in ECS compliance. Cigarette smoking has been found to be a predictor of noncompliance with prescribed therapy across several fields of research,[8-16] and smoking cessation has been reported to be predictive of increased adherence to therapy.[17] To our knowledge, cigarette smoking has not previously been reported as a predictor of noncompliance with compression stocking use. Higher BMI has been associated with less willingness to adhere to general health care requests/recommendations and to wear custom-made footwear to prevent diabetic ulcers than patients with lower BMIs,[18,19] and among patients with chronic venous insufficiency, BMI was significantly associated with less compliance with compression therapy.[20] Conversely, as patients with higher BMI are more likely to have preexisting or to develop higher-grade chronic venous insufficiency,[21] it is possible that higher-BMI patients in our

study were more compliant with ECSs due to greater chronic venous symptom burden.

Factors that have previously been reported to influence compliance with ECSs include degree of compression, history of prior DVT, and, in patients with chronic venous insufficiency, time since diagnosis. In a recent review that included compliance information on 8104 patients who were prescribed ECSs, good compliance was reported in 66.2% of these patients, and stockings <25 mm Hg were associated with better compliance (77% vs. 64.6%).[4] Lesser degrees of compression may encourage greater compliance; however, in one study examining ECSs for secondary prevention of venous ulcers, ECSs with lower compression strength were associated with greater recurrence of venous ulcers.[22] Therefore, physicians should carefully evaluate both patient capacity to comply and the specific indication for recommending ECSs when deciding on which ECS compression strength to prescribe.

Our study has several strengths. As this was a secondary analysis of a multicenter randomized trial, the inception population was well defined, and baseline characteristics were well documented. Detailed information on stocking compliance and reasons for noncompliance were prospectively collected at each study follow-up visit.

Our study also has certain limitations. Compliance was assessed by patient self-report, and we cannot be certain that this reflects the actual use of stockings by patients. The patients in this cohort were given study stockings free of charge, which were delivered directly to their homes, and therefore noncompliance may be greater in real-life cohorts where the cost of ECSs is not covered by medical insurance and the patients had to travel to be measured for, order, and pick up their ECSs. The loss of patients to follow-up over time may have led to an overestimation of compliance with ECS use, as patients who were noncompliant with study visits may have also been noncompliant with ECS use. Moreover, our results describe compliance trends of study patients treated in North America, where fewer physicians prescribe ECSs than physicians in Germany or Ireland.[23–25] It is possible that compliance may be greater in countries where physicians more often prescribe ECSs in clinical practice, as more thorough endorsement of stockings use by physicians has been shown to increase ECS compliance compared with providing minimal explanation to patients.[26] Indeed, European trials of ECSs have reported great compliance (>80% of patients deemed compliant, wearing ECSs at least 6 days per week) with ECSs for the prevention of PTS than in the SOX Trial. The reasons for and predictors of noncompliance observed in the SOX Trial are specifically applicable to patients with a first symptomatic DVT who participated in a trial of the use of stockings for the purpose of prevention of PTS. However, compliance rates of use of ECSs have been reported to be similar whether prescribed for prevention of PTS or treatment of venous insufficiency.[4] Therefore, our results may be generalizable to patients using ECSs for treatment of acute DVT symptoms or chronic venous insufficiency, including PTS. Finally, we acknowledge that in the SOX Trial, wearing a graduated ECS for 2 years after DVT did not reduce the incidence of PTS, which could call into question the relevance of our compliance analysis. However, as compression stockings are commonly used to treat PTS and other forms of chronic venous insufficiency, understanding factors that influence compliance remains relevant.

In conclusion, the most frequent predictors of being an ECS noncomplier were aversive aspects of ECSs and patient behavior-related factors. As ECSs are used in clinical practice to manage symptoms of acute and chronic venous disease, including PTS, our results provide insight into why patients do not wear ECSs, and suggest that improving the appeal and tolerability of ECSs, as well as education directed at modifying patient behaviors, may improve stocking compliance.

RELATIONSHIP DISCLOSURES

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AUTHOR CONTRIBUTIONS

AJD cowrote the manuscript. AA performed the statistical analyses. DM provided administrative assistance for the study. SRK conceived of the idea for the study, obtained grant funding, and cowrote the manuscript. All authors reviewed and provided input into the final manuscript. All authors had access to the data and a role in writing the manuscript.

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