

Explaining the Amount and Consistency of Medical Care and Self-Management Support in Asthma: A Survey of Primary Care Providers in France and the United Kingdom



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What is already known about this topic? Previous research suggests that there may be variation in the content of asthma care delivered in primary care, between and within countries.

What does this article add to our knowledge? This study reveals that the amount and consistency of asthma care varies substantially between primary care providers in the United Kingdom and France, and identifies important modifiable predictors of suboptimal care delivery.

How does this study impact current management guidelines? Involving nurses in asthma care, making patient expectations visible, and providing more training to enhance skills and confidence in asthma care delivery could improve the quality of asthma medical care and self-management support.

BACKGROUND: The quality of asthma primary care may vary between countries, health care practices, and health care professionals (HCPs). Identifying and explaining such differences is critical for health services improvement.

OBJECTIVES: To examine the quality of asthma primary care in France and United Kingdom, and identify within-country and between-country predictors amenable to intervention.

METHODS: An online questionnaire to capture asthma medical care and self-management support, practice characteristics, and psychosocial determinants was completed by 276 HCPs. Mokken scaling analyses were used to examine item structure

and consistency. Hierarchical regression analyses were used to identify predictors of the amount (number of asthma care activities HCPs delivered) and consistency (the degree to which HCPs deliver similar care) of asthma medical care and self-management support.

RESULTS: On average, HCPs reported delivering 74.2% of guideline-recommended care. Consistency of medical care and self-management support was lower among HCPs delivering a lower amount of care ($r = 0.58$ and $r = 0.57$, $P < .001$). UK HCPs provided more and more consistent asthma self-management support—but not medical care—than French HCPs, which was explained by the presence of practice nurses in the United Kingdom. More training, positive social norms, and higher behavioral control explained better quality of care across all HCPs.

CONCLUSIONS: Using carefully developed questionnaires and advanced psychometric analyses, this study suggests that involving practice nurses, making social expectations visible, and providing more training to enhance skills and confidence in asthma care delivery could enhance the amount and consistency of asthma primary care. This needs to be corroborated in a future intervention trial. © 2018 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2018;6:1916-25)

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Abbreviations used
HCPs- Health care providers
MSA- Mokken scaling analyses
QOF- Quality and Outcomes Framework
TPB- Theory of planned behavior
UK- United Kingdom

professionals (HCPs) in primary care to deliver medical and self-management support.⁵⁻⁷ For these guidelines to benefit patients, they need to be widely adopted.⁸ Studies suggest that asthma care delivery is suboptimal,⁹⁻¹⁹ but research on this topic is still incipient. Most available studies have focused on a limited set of guideline-recommended activities and measured guideline implementation indirectly (eg, through HCP knowledge tests or vignettes with hypothetical scenarios). No prior investigation focused on how much (the amount) of the guideline-recommended activities were routinely delivered to patients, explored whether different HCPs deliver similar asthma care (the consistency of care), or identified factors that explain differences in the quality of asthma care provided. To progress, we need to examine both the amount and consistency of asthma care using a comprehensive set of questions that capture medical care and self-management support directly (ie, measure HCP behavior rather than guideline knowledge), and identify the main quality of care determinants that can be targeted in future service improvement interventions.

Within a European Commission-funded asthma cohort study in the United Kingdom (UK) and France,²⁰ we aimed to investigate the amount, consistency, and determinants of asthma care in primary care. The 2 different health care systems also provided an opportunity for between-country comparisons and reflecting on system-level influences on the quality of asthma care provided. Since 2004, UK primary care has been guided by a performance management framework called the Quality and Outcomes Framework (QOF), which includes performance pay for several guideline-recommended asthma care activities. Some studies suggest that QOF resulted in improved performance on incentivized indicators of quality of care.^{21,22} The French health care system is similar to the UK system as it provides universal cover through a combination of public and private hospital and ambulatory care²³; however, historically, it has been more focused on hospital-based and specialist care.²⁴ A pay-for-performance system to meet several prevention, prescription, and chronic disease management goals was introduced in France in 2008, but with limited success.²⁴ These system-level differences would be expected to result in differences in how asthma care is delivered in primary care. In particular, the expectation could be that asthma primary care in the UK is more comprehensive and consistent than in France.

The current study examined and compared the amount and consistency of medical care and self-management support provided to asthma patients in primary care in the UK and France, and aimed to identify determinants that can explain variations in care within and between countries.

METHODS

Study design and participants

HCPs participating in patient recruitment for the ASTRO-LAB cohort in France and the UK (maximum 4 HCPs per practice)

TABLE I. Psychosocial determinants of self-management support

Determinant	Example content	No. of items	Cronbach's α	Mean (SD)		t-test (df)	P value
				France	UK		
Attitude	"I think that, overall, self-management support is: totally my responsibility ... not at all my responsibility"	8	0.85	5.41 (0.84)	5.55 (0.88)	1.329 (250.64)	.185
Subjective norms	"Most of my patients expect me to provide self-management support: strongly agree ... strongly disagree"	6	0.87	4.71 (1.01)	5.4 (1.18)	5.096 (233.53)	<.001
Perceived behavioral control	"I am confident that I can provide self-management support when I have limited time with the patient: strongly agree ... strongly disagree"	10	0.93	4.15 (1.1)	4.55 (1.42)	2.533 (217.61)	.012

df, Degree of freedom; SD, standard deviation.

TABLE II. Sample characteristics—descriptive statistics

Characteristic	France (n = 156)	UK (n = 120)	P value
Gender (women)	53 (33.97%)	71 (59.2%)	<.001
Use of guidelines (yes)	103 (66.0%)	118 (98.3%)	<.001
Age			
Less than 30 y	0 (0%)	3 (2.5%)	.088
30 to 39 y	26 (16.67%)	26 (21.7%)	
40 to 49 y	42 (26.92%)	39 (32.5%)	
50 to 59 y	73 (46.79%)	45 (37.5%)	
60 y and above	15 (9.62%)	7 (5.8%)	
Years of experience in asthma care			
Less than 5 y	10 (6.41%)	15 (12.5%)	.044
5 to 9 y	21 (13.46%)	20 (16.7%)	
10 to 19 y	45 (28.85%)	42 (35.0%)	
20 to 29 y	55 (35.26%)	35 (29.2%)	
30 y and above	25 (16.03%)	8 (6.7%)	
Asthma-specific training			
During university studies	110 (70.5%)	106 (88.3%)	<.001
Ongoing professional development (eg, workshops or conferences)	94 (60.3%)	98 (81.7%)	<.001
Patient education training			
During university studies	58 (37.2%)	91 (75.8%)	<.001
Ongoing professional development (eg, workshops or conferences)	115 (73.7%)	89 (74.2%)	1

Note: Group comparisons performed with Fisher's exact test for binary, Wilcoxon rank-sum test for ordinal, and *t*-tests for continuous variables.

were invited via email to complete an online survey on their asthma care practices. No additional selection criteria were used. Thus, the sample size was determined by the number of HCPs in the cohort willing to participate.

The study received ethics approval in the UK from the NRES Committee London — West London (REC reference 12/LO/2039, protocol number 282593, IRAS project ID 112186). In France, it received the approval of the CCTIRS for observational studies in health (Advisory Committee for Data Processing in Health Research, reference number 12.702) and of the CNIL (National Commission on Informatics and Liberty, EGY/FLR/AR134392) regarding data privacy.

Measures

The survey included questions on routine provision of medical care and self-management support to patients with persistent asthma who were prescribed (at least) daily use of an inhaled corticosteroid. We also collected data on HCP and practice characteristics, including HCP psychosocial determinants of providing asthma care.

Asthma care activities

To identify core medical care and self-management support activities for asthma management in primary care, we reviewed the literature on asthma care measurement and recent guidelines.⁵⁻⁷ We identified 2 questionnaires.^{17-19,25} As self-management support, particularly medication adherence, was less detailed in these guidelines and tools, we adapted additional items from previous research assessing adherence support in routine clinical care in other conditions.²⁶⁻²⁸ The items identified were formulated in English and back-translated to French. Cognitive ("think-aloud") interviews with 6 HCPs in both countries

were conducted to ensure relevance and comprehensibility. After this process, we aimed to ensure a good coverage of asthma care activities relevant for achieving good clinical outcomes, which HCPs can relate to and report on with minimal response burden.

The checklist included 12 medical and 25 self-management support activities. The item content and sources are detailed in Table E1, available in this article's Online Repository at www.jaci-inpractice.org. In line with research suggesting that self-reports of behavior are more accurate amongst people performing a behavior routinely (most or all of the time),²⁹ we asked HCPs whether during the last 12 months they performed that activity with the majority of their patients on daily preventer therapy. The response options were "Yes," "No," and "I don't know" (recoded to "No" for analysis). Previous meta-analyses in another topic area (human immunodeficiency virus care) demonstrated high reliability and strong predictive validity of this approach.^{26,27} To further increase validity and limit social desirability, the survey was anonymous and reassured respondents in an introductory statement that its purpose was not to verify HCP's knowledge, but to understand their daily practice and personal perspectives.

HCP and practice characteristics

Additional survey questions measured practice characteristics, sociodemographics, and professional background. We also assessed psychosocial determinants of care delivery based on the theory of planned behavior (TPB), which has been extensively used to explain patient and HCP behaviors.^{30,31} TPB states that to perform a behavior people need to value performance of the behavior positively (attitude), perceive that other significant people perform or expect them to perform the behavior (subjective norms), and feel confident in their ability to perform the behavior (perceived behavioral control), and consequently have a strong intention to act accordingly (behavioral intention). To limit respondent burden, TPB questions were formulated only for self-management support. We used a 7-point Likert response scale and included 24 attitude, subjective norm, and perceived behavioral control items (see Table I for example items).

Analysis

Data analyses were conducted using R.³² Between-country differences were explored using Fisher's exact tests for binary, Wilcoxon rank-sum tests for ordinal, and *t*-tests for continuous variables; comparisons referring to individual asthma care delivery activities were Holm-adjusted for multiple testing.

The amount of medical care and self-management support were computed as the total number of care activities reported. To examine consistency of care *at the country level*, we first performed Moken scaling analyses (MSA),³³ per country, using items with sufficient variability (ie, endorsed by 5% to 95% of HCPs). MSA is a nonparametric item response theory methodology commonly used to examine the psychometric properties of item sets developed to measure unidimensional constructs and differing in levels of difficulty (frequencies of endorsement in a given sample). Items and scales are evaluated in terms of homogeneity, monotonicity, local independence, and invariant item ordering; items that meet these criteria are considered appropriate for calculating global scores that reflect differences between respondents on a latent ordinal construct.³⁴ Scale dimensionality was tested against a homogeneity threshold of $H = 0.30$. An exploratory item selection algorithm (aisp) was performed at increasing homogeneity thresholds to identify unidimensional scales.³⁵ Monotonicity and invariant ordering assumptions were examined to identify item subsets that

TABLE III. Frequencies of reporting medical care activities and significance tests for between-country differences (ordered from most to least frequent in France)

Medical care activity	No. (%) of HCPs reporting routine delivery			
	France (n = 156)	UK (n = 120)	P value	P value (Holm)
Assess smoking status for patients over 13 y old	154 (98.72%)	118 (98.33%)	1.000	1.000
Step-up treatment if patients have poor asthma control	152 (97.44%)	119 (99.17%)	.392	1.000
Question patients to identify asthma triggers	148 (94.87%)	107 (89.17%)	.108	.972
Refer to an asthma specialist if poor asthma control	144 (92.31%)	99 (82.50%)	.015	.150
Perform or refer to repeated lung function tests—over 8 y old	136 (87.18%)	102 (85.00%)	.603	1.000
Discuss how to avoid or manage triggers	120 (76.92%)	102 (85.00%)	.125	.972
Perform or refer to allergy testing	118 (75.64%)	12 (10.00%)	<.001	<.001
Assess comorbid conditions and prescribe treatment if needed	118 (75.64%)	81 (67.50%)	.139	.972
Delay stepping-up treatment when poor adherence or inhaler use	116 (74.36%)	98 (81.67%)	.190	.972
Assess smoking status of coinhabitants (parents, partner, and roommate)	115 (73.72%)	77 (64.17%)	.113	.972
Ask patients whether they have been able to manage triggers	95 (60.90%)	69 (57.50%)	.621	1.000
Use a validated set of questions to assess symptoms	30 (19.23%)	93 (77.50%)	<.001	<.001
Mean (SD)	9.27 (1.63)	8.97 (1.84)	.17	
No. of HCPs delivering all activities	10 (6.4%)	6 (5%)		

HCP, Health care professional; SD, standard deviation.

Note: Group comparisons via Fisher's exact test with unadjusted and Holm-adjusted P values.

reflect how consistent asthma care is in each country. Consistency of care at the individual HCP level was operationalized as the number of Guttman errors (G estimates), a person-fit indicator in MSA that reflects how consistent individual HCP response patterns are with the sample-characteristic response pattern (higher scores reflect lower consistency).^{36,37}

To examine which factors explain the amount and consistency of care, 4 hierarchical regression analyses were conducted with asthma care sum scores (amount) and G estimates (consistency) of medical care and self-management support as dependent variables. The regression analyses included 3 models: (1) country, (2) practice characteristics, and (3) individual characteristics, including psychosocial determinants for self-management support only. To allow for the analysis of both the effect of country and of profession (ie, in the UK, nurses—not only general practitioners (GPs)—also deliver asthma care), a dummy variable distinguishing French GPs from UK HCPs was included in model 1 (test for country differences), and model 2 included a dummy variable for “UK nurse” (to compare UK GPs, with UK nurses and French GPs). We ran the analyses including all predictor variables, and once using a more parsimonious model that included only practice and individual HCP characteristics that showed at least weak bivariate associations with the dependent variables (Pearson's r , $P \leq .10$; correlations in Table E2, available in this article's Online Repository at www.jaci-inpractice.org). Results were essentially identical, and the full models are reported here.

The dataset used for these analyses can be found at osf.io/wk8vm.

RESULTS

Sample characteristics

A total of 276 HCPs completed the survey between November 2013 and January 2016: 156 (56.5%, all GPs) in France and 120 (43.5%; 68 GPs and 52 practice nurses) in the UK. UK practices were larger, with 15.8% (UK) and 62.8% (France) working in a practice with 1 to 3 GPs, and 40.9% (UK) versus 0.6% (France) in practices with >6 GPs. Only UK practices also employed nurses (100%), health care assistants

(67.5%), and pharmacists (24.2%). UK HCPs had consultations with patients with asthma more often than French HCPs (85.8% vs 39.7% saw at least 1 patient with asthma every week). French HCPs performed asthma review consultations every 3 months (57.7%) or 6 months (28.8%), which lasted 15 (41.03%) or 20 (46.1%) minutes. UK HCPs saw patients less frequently (30.0% at 6 months and 60.8% at 12 months), and consultations were shorter for GPs (88.3% had 10 minutes) and similar for nurses (26.7% had 15 minutes and 54.2% 20 minutes). Except for 2 French HCPs, all respondents had peak flow meters available in the practice. UK practices were however better equipped than French GPs with spirometers (98.3% vs 24.4%), pulse oximeters (99.1% vs 59.6%), large volume spacers (93.3% vs 78.2%), and nebulizers (98.3% vs 9.6%). The use of guidelines for asthma management was reported by 66% of French HCPs (eg, Global Initiative for Asthma or Haute Autorité de Santé) versus 98.3% UK HCPs (eg, National Institute for Health and Care Excellence or Scottish Intercollegiate Guidelines Network). Common sociodemographics and professional background characteristics are presented in Table II. There were no differences between France and the UK in attitudes and perceived behavioral control regarding self-management support, whereas subjective norms were more favorable in the UK (Table II).

Amount of asthma care delivered

The percentages of French and UK HCPs reporting delivering individual medical care and self-management support activities, and the mean (standard deviation) amount of care delivered per country, are presented in Tables III and IV. There were significant differences between France and the UK on 2 medical care and 10 self-management support activities. The items that stand out are the much higher rates of allergy testing in France, and the much higher rates of using validated asthma control questionnaires in the UK.

Of all HCPs, 5.8% delivered all medical care activities, and 8.3% all self-management support activities on average, 27.4 of the 37 asthma care activities (74.2%) were delivered routinely,

TABLE IV. Frequencies of reporting adherence support activities and significance tests for differences

Adherence support activity	No. (%) of HCPs reporting routine delivery		<i>P</i> value	<i>P</i> value (Holm)
	France (n = 156)	UK (n = 120)		
Explain the difference between preventer and reliever medication	154 (98.72%)	119 (99.17%)	1.000	1.000
Discuss what to do in case of worsening symptoms or an asthma attack	150 (96.15%)	118 (98.33%)	.472	1.000
Discuss the importance of taking the inhaler medication as prescribed for achieving asthma control	146 (93.59%)	118 (98.33%)	.074	.740
Explain what their medication does to control asthma	145 (92.95%)	119 (99.17%)	.015	.168
Ask patients if they have any concerns about using their inhaler medication as prescribed	140 (89.74%)	92 (76.67%)	.004	.060
If patients report adherence difficulties, discuss what can be done to overcome these	139 (89.10%)	113 (94.17%)	.196	1.000
Ask patients whether they have always taken their inhaler medication as prescribed since their last visit	133 (85.26%)	105 (87.50%)	.725	1.000
Explain what happens to the lungs during an asthma attack	126 (80.77%)	99 (82.50%)	.756	1.000
Discuss the risks of not taking inhaler medication regularly or stopping treatment	123 (78.85%)	108 (90.00%)	.014	.168
Plan storing spare asthma inhalers at strategic places (office, car, school)	123 (78.85%)	75 (62.50%)	.003	.048
Ask patients with poor asthma control to come more frequently to the clinic	123 (78.85%)	116 (96.67%)	<.001	<.001
Discuss with patients which inhaler device they prefer to use	115 (73.72%)	83 (69.17%)	.421	1.000
Inquire about side effects and discuss how these can be managed if present	115 (73.72%)	86 (71.67%)	.785	1.000
Encourage patients who you perceive as having good adherence	112 (71.79%)	107 (89.17%)	<.001	<.001
Ask patients to show how they use their inhaler	111 (71.15%)	104 (86.67%)	.002	.034
Explain common side effects and how to deal with them	100 (64.10%)	103 (85.83%)	<.001	<.001
Practice how to use inhalers	99 (63.46%)	101 (84.17%)	<.001	<.001
Explain the difference between asthmatic and normal airways	91 (58.33%)	99 (82.50%)	<.001	<.001
Ask patients how confident they feel in their ability to take the inhaler medication as advised	87 (55.77%)	75 (62.50%)	.270	1.000
Discuss common barriers to taking inhaler medication as prescribed (adherence), and how to deal with these	83 (53.21%)	69 (57.50%)	.542	1.000
Together with the patients discuss an individualized plan of where, when, and how to take their medication	82 (52.56%)	91 (75.83%)	<.001	<.001
Discuss with patients how they can monitor their asthma control using symptom diaries or a peak flow meter	61 (39.10%)	97 (80.83%)	<.001	<.001
Ask patients to identify daily routines (eg, brushing teeth) to remember to use inhaler medication at these times	50 (32.05%)	74 (61.67%)	<.001	<.001
Develop with patients a written action plan detailing medication intake instructions that they can follow at home	44 (28.21%)	52 (43.33%)	.011	.143
Encourage patients to use reminders (eg, an alarm) to remember their inhaler medication use	32 (20.51%)	43 (35.83%)	.006	.084
Mean (SD)	17.21 (4.16)	19.72 (4.34)	<.001	
No. of HCPs delivering all activities	5 (3.2%)	18 (15%)		

HCP, Health care professional; SD, standard deviation.

Note: group comparisons via Fisher's exact test with unadjusted and Holm-adjusted *P* values.

and only 1.8% HCPs delivered all activities. The amount of care was similar in both countries for medical care, $t(239.29) = 1.38$, $P = .17$, whereas asthma self-management support scores were higher in the UK, $t(250.3) = 4.85$, $P < .001$. Note that "I don't know" responses (recoded to "No" for analysis) were given in only 1.4% of the answers.

Consistency of asthma care at country level

Medical care. Ten activities could be included in the Mokken scaling analysis (2 items endorsed by >95% were removed). In France, activities were unrelated: scale H(standard error [SE]) = 0.13 (0.03), item H(SE) = 0.04 (0.05)-0.19 (0.14). In the UK, 5 of 10 medical care activities formed a unidimensional scale:

TABLE V. Hierarchical regression analyses for the amount and consistency of medical care (unstandardized estimates and standard errors)

	Amount			Consistency		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	8.975*** (0.157)	8.249*** (0.488)	6.681*** (0.661)	11.300*** (0.323)	11.191*** (1.015)	9.399*** (1.401)
Country (France)	0.294 (0.209)	0.719 (0.381)	0.975* (0.400)	0.854* (0.430)	−0.016 (0.792)	−0.244 (0.848)
Specialty (nurse)		1.188** (0.371)	1.030* (0.432)		1.022 (0.772)	0.156 (0.915)
Caseload (high)		0.243 (0.233)	0.306 (0.235)		−0.450 (0.486)	−0.304 (0.497)
Frequency consultations		−0.021 (0.030)	−0.008 (0.030)		−0.116 (0.063)	−0.118 (0.064)
Minutes consultation		0.016 (0.027)	0.008 (0.028)		0.088 (0.057)	0.077 (0.059)
Gender (female)			0.053 (0.249)			0.687 (0.527)
Age (groups)			0.308 (0.188)			0.727 (0.398)
Years of experience			−0.138 (0.159)			−0.194 (0.337)
Asthma in university studies			0.869*** (0.253)			0.343 (0.536)
Asthma ongoing professional development			0.213 (0.242)			−0.301 (0.513)
R^2	0.007	0.074	0.126	0.014	0.056	0.076
Adjusted R^2	0.004	0.057	0.093	0.011	0.039	0.041

Note: more Guttman errors reflect less consistent care; this variable was reversed here to reflect consistency (rather than inconsistency).

* $P < .05$, ** $P < .01$, *** $P < .001$.

scale $H(SE) = 0.55 (0.08)$, item $H(SE) = 0.43 (0.15)$ –0.84 (0.10), $\alpha = 0.62$ (95% confidence interval = 0.47–0.78), showing latent monotonicity and invariant item ordering. Hence, French HCPs were likely to deliver different combinations of medical care activities (even when delivering the same amount of care), whereas in the UK, half of the activities constituted a shared or consistent approach.

Self-management support. In France, 2 of 25 activities endorsed by >95% of respondents were excluded; the remaining 23 items showed low homogeneity: scale $H(SE) = 0.23 (0.03)$, item $H(SE) = 0.08 (0.05)$ –0.35 (0.07). Exploratory aisp suggested a 9-item homogeneous scale demonstrating latent monotonicity and invariant item ordering. In the UK, of the 20 items endorsed by <95%, 17 formed a unidimensional scale: $H(SE) = 0.41 (0.05)$, item $H = 0.30 (0.09)$ –0.57 (0.09), showing latent monotonicity and invariant item ordering. Hence, in France, 11 of 25 activities, whereas in the UK, 22 of 25 activities formed coherent approaches. Aisp analyses are detailed in Tables E3 to E6, available in this article's Online Repository at www.jaci-inpractice.org.

Consistency of care at the HCP level: number of Guttman errors

When comparing individual HCP responses to response patterns common to the whole sample, the consistency of care was similar in both countries for medical care, $t(229.65) = 1.938$,

$P = .05$; mean = 3.87 and 4.70 in France and the UK, whereas self-management support was less consistent in France, $t(246.9) = 3.056$, $P = .003$; mean = 20.55 and 15.53 in France and the UK.

Associations between the amount and consistency of care

HCPs who delivered more medical care also delivered more self-management support ($r = 0.54$; $P < .001$). Moreover, HCPs who delivered medical care that was more consistent with that of other HCPs also delivered self-management support that was more consistent with their peers ($r = 0.18$; $P = .003$). Finally, HCPs who delivered more medical care and self-management support delivered this care more consistently ($r = 0.58$ and 0.57 , respectively; $P < .001$). Hence, scores for both components of care and of quality of care converged: care delivery is much more variable between different HCPs who are already delivering less of the guideline-recommended care (and vice versa).

Multivariate analyses explaining asthma care delivery

Medical care. In model 1, country did not explain the amount of medical care (Table V). Model 2 revealed that both UK nurses and French GPs delivered more medical care than the UK GPs. Model 3 showed that HCPs trained in asthma care

TABLE VI. Hierarchical regression analyses for the amount and consistency of self-management support (unstandardized estimates and standard errors)

	Amount			Consistency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	19.717*** (0.387)	16.377*** (1.137)	4.933* (1.977)	53.467*** (1.222)	48.878*** (3.781)	27.143*** (7.054)
Country (France)	−2.512*** (0.515)	−0.743 (0.888)	0.906 (0.901)	−5.012** (1.625)	0.492 (2.952)	1.961 (3.215)
Specialty (nurse)		4.395*** (0.866)	4.124*** (0.980)		10.717*** (2.877)	9.746** (3.498)
Caseload(high)		0.788 (0.544)	0.601 (0.505)		2.188 (1.809)	1.763 (1.801)
Frequency consultations		−0.026 (0.070)	0.041 (0.065)		−0.085 (0.234)	0.021 (0.231)
Minutes consultation		0.075 (0.064)	0.062 (0.060)		−0.080 (0.213)	−0.045 (0.214)
Gender(female)			−0.826 (0.535)			−1.679 (1.907)
Age (groups)			0.194 (0.404)			0.439 (1.442)
Years of experience			−0.089 (0.341)			0.965 (1.219)
Asthma in university studies			0.703 (0.564)			−0.288 (2.013)
Asthma ongoing professional development			0.803 (0.534)			−2.528 (1.905)
Communication undergrad or postgrad training			1.228* (0.519)			2.052 (1.852)
Communication ongoing professional development			1.042* (0.526)			2.734 (1.878)
Attitudes			0.183 (0.356)			−0.642 (1.270)
Subjective norms			0.937** (0.282)			2.664** (1.005)
Perceived behavioral control			0.504* (0.218)			1.227 (0.777)
R ²	0.080	0.227	0.400	0.034	0.100	0.191
Adjusted R ²	0.077	0.213	0.365	0.030	0.083	0.144

Note: more Guttman errors reflect less consistent care; this variable was reversed here to reflect consistency (rather than inconsistency).

* $P < .05$, ** $P < .01$, *** $P < .001$.

during their university studies delivered more guideline-compatible medical care.

French GPs delivered more consistent medical care (Table V, model 1), but this effect became nonsignificant when practice and individual characteristics were added in models 2 and 3. No significant effects on consistency of medical care were identified.

Self-management support. Country did predict the amount of self-management support, with French GPs providing less support than UK HCPs (Table VI). Model 2 suggested that this effect was explained by the availability of nurses in the UK. In model 3, asthma-specific training (ongoing professional development), patient education training (university studies), subjective norms (“do others expect me to deliver this?”), and perceived behavioral control (“am I able to deliver this?”) explained the amount of self-management support provided.

UK HCPs delivered more consistent self-management support than French GPs (Table VI, model 1). This effect seemed entirely explained by the presence of nurses in the UK (model 2). In model 3, subjective norms also explained consistency of self-management support.

Model diagnostics revealed 1 influential case in 3 of the models, but removal did not influence the results reported here. Given the finding that nurses play such an important role in asthma care delivery in the UK, Table E7 in this article’s Online Repository at www.jaci-inpractice.org provides the description for UK GPs and nurses separately.

DISCUSSION

Using carefully developed tools, advanced psychometric methods, and data from 2 countries, this study is—to our knowledge—the first to examine and demonstrate that the

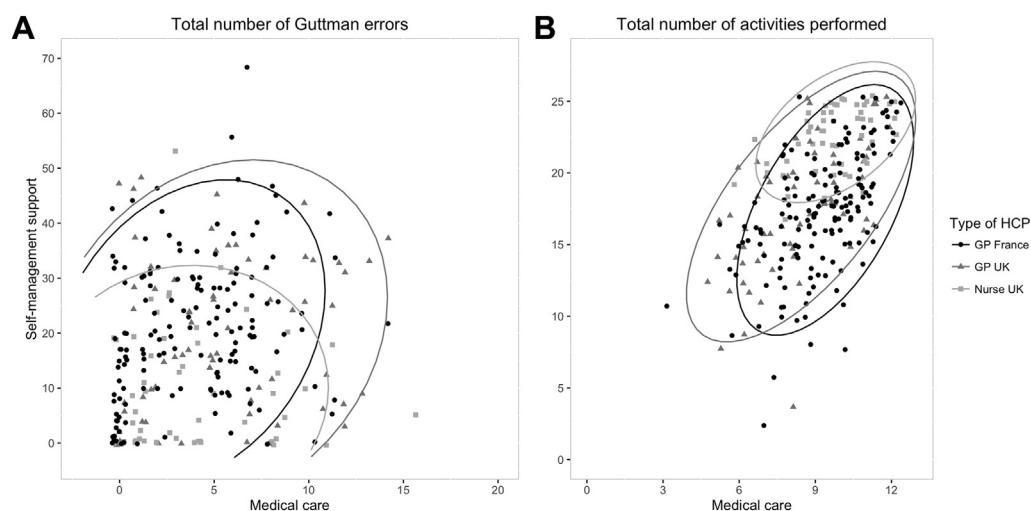


FIGURE 1. The association between **(A)** the consistency and **(B)** the amount of self-management support (y-axis) and medical care (x-axis). Higher scores on Guttman errors reflect lower consistency of care. Higher scores on number of activities performed reflect a higher amount of care provided. Different symbols are used for the different health care professionals (HCPs), and the lines reflect 95% confidence intervals per HCP. HCPs reporting more consistent self-management support also report delivering more consistent medical care; and the same holds for the amount of care provided. *GP*, general practitioner.

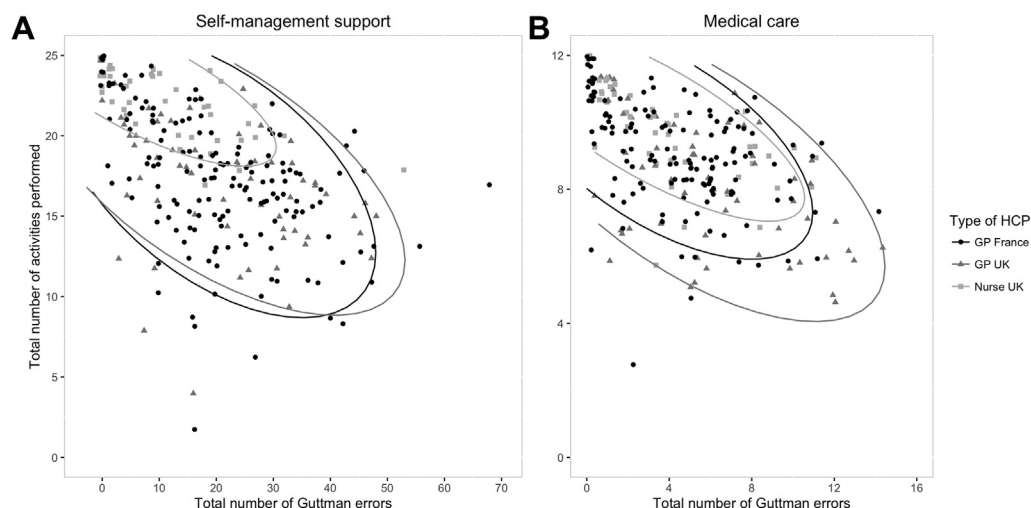


FIGURE 2. The association between the amount (y-axis) and consistency (x-axis) of **A**, self-management support and **B**, medical care. Different symbols are used for the different HCPs, and the lines reflect 95% confidence intervals per health care professional (HCP). The negative associations suggest that HCPs delivering a higher number of guideline-based care activities also provide more consistent care (lower scores on Guttman errors). Nurses report delivering more and more consistent medical care and self-management support than general practitioners (GPs).

amount and consistency of asthma care provided in France and the UK are highly variable. Importantly, the consistency in the care delivered was low especially for medical care and amongst HCPs already delivering fewer of the guideline-recommended asthma care activities. We were also able to identify country, system, and individual HCP differences explaining variability in asthma care in multivariate models. The hypothesis that country predicts the amount and consistency of care was only confirmed for self-management support. Another key finding was that UK nurses tended to deliver more asthma care and in a more consistent manner than GPs (also illustrated in [Figures 1 and 2](#)),

but our analysis did not provide an explanation for that. Finally, HCPs' degree of training in medical care and patient education, and more positive subjective norms (ie, "do others expect me to deliver this?") and perceptions of control (ie, "am I able to deliver this?"), explained variability in asthma care. Hence, recommendations for policy and practice would be to involve practice nurses in French primary care, making patient expectations and best practice examples visible to HCPs (subjective norms), and expanding HCP training both in asthma and patient education to enhance knowledge, skills, and confidence (perceived behavioral control) in delivering high-quality asthma care.

HCPs were on average able to deliver 75% of the activities recommended in guidelines, but only 1.8% were able to deliver all. This may reflect previously reported difficulties in applying guidelines in routine practice.¹⁶ Regarding the consistency of care, we could not find any other quality of care studies that examined this characteristic of care delivery; yet a shared approach to care between different HCPs reflects the success of guideline implementation and could be a valuable indicator for guideline developers. The consistency analyses we developed in this study revealed considerable differences between the theoretical structure of asthma care (what should be delivered) and its real structure (how HCPs deliver care). In practice, this means patients are likely to receive different care if they would visit different HCPs, even if these provide exactly the same amount of care. Hence, it could be useful for future quality of care research to include measures of both the amount and consistency of care. Our findings also suggest that interventions to improve the quality of care likely require changes at the policy, management, and HCP level. Therefore, future studies on the quality of asthma care should explore system, practice, and individual HCP level determinants of asthma care.

This study has several strengths and limitations. It used a carefully designed, comprehensive questionnaire to assess both medical care and self-management support in 2 countries. Other studies on quality of asthma care provided an excellent starting point for this study, but typically focused on a narrower selection of guideline components.^{9,10,13-16} Moreover, we used these data to examine the amount and consistency of care provided, which to our knowledge is a novel approach relevant to evaluating quality of care in a population of HCPs. Finally, we examined what factors amenable to intervention explain both the amount and consistency of care, identifying avenues for improving both components. Collecting data in 2 countries also allowed for cross-country comparisons. A possible limitation is that socially desirable responses may have led to an overestimation of the care delivered. On the other hand, recall difficulties could have led to an underestimation of care provided, because the response option "I don't know" (whether I routinely deliver this care to my asthma patients) was recoded to "No" (although only 1.4% of the responses was "I don't know"). With only 1.8% reporting delivering all activities, ceiling effects were not observed. Moreover, the strong correlation between the amount and consistency of care can be interpreted as evidence of convergent validity, and the significant variance in the amount and consistency of care predicted by other variables also suggests a valid assessment. Second, the determinants investigated in this study explained a limited amount of variance, particularly in medical care. Further work could explore what other system, practice, and individual level determinants are relevant here. Third, although the participating HCPs formed a sufficiently large and heterogeneous sample for the analyses conducted, they might not be fully representative of UK and French primary care professionals. Fourth, this study was embedded in a larger cohort study on the safety and effectiveness of long-acting β_2 -agonists. The sample size of this study was not defined *a priori* but determined by the number of practices in this cohort and the response rates of the participating practices.

CONCLUSIONS

In this study, we developed a new questionnaire to capture asthma medical care and self-management support, which

showed good psychometric properties. Item response theory analyses allowed us to examine both the amount and consistency of asthma care—2 relevant but conceptually different quality of care dimensions. Our findings suggest that changes in resources (ie, involving nurse practitioners in asthma care delivery), more asthma-specific and patient education training for HCPs, and providing normative feedback to individual HCPs could enhance the quality of asthma care in the UK and France. This needs to be corroborated in a future intervention trial.

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REFERENCES

- To T, Stanojevic S, Moores G, Gershon AS, Bateman ED, Cruz AA, et al. Global asthma prevalence in adults: findings from the cross-sectional world health survey. *BMC Public Health* 2012;12:204.
- Masoli M, Fabian D, Holt S, Beasley R. Global Initiative for Asthma (GINA) Program. The global burden of asthma: executive summary of the GINA Dissemination Committee Report. *Allergy* 2004;59:469-78.
- O'Byrne PM, Pedersen S, Schatz M, Thoren A, Ekholm E, Carlsson L-G, et al. The poorly explored impact of uncontrolled asthma. *Chest* 2013;143:511-23.
- Chapman KR, Boulet LP, Rea RM, Franssen E. Suboptimal asthma control: prevalence, detection and consequences in general practice. *Eur Respir J* 2008;31:320-5.
- Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J* 2008;31:143-78.
- Levy ML, Thomas M, Small I, Pearce L, Pinnock H, Stephenson P. Summary of the 2008 BTS/SIGN British Guideline on the Management of Asthma. *Prim Care Respir J* 2009;18 Suppl 1:S1-16.
- National Heart, Lung, and Blood Institute. National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma—full report. Bethesda, MA: National Heart, Lung, and Blood Institute; 2007.
- Boulet L-P, FitzGerald JM, Levy ML, Cruz AA, Pedersen S, Haastela T, et al. A guide to the translation of the Global Initiative for Asthma (GINA) strategy into improved care. *Eur Respir J* 2012;39:1220-9.
- Cabana MD, Rand CS, Becher OJ, Rubin HR. Reasons for pediatrician nonadherence to asthma guidelines. *Arch Pediatr Adolesc Med* 2001;155:1057-62.
- Finkelstein JA, Lozano P, Shulruff R, Inui TS, Soumerai SB, Ng M, et al. Self-reported physician practices for children with asthma: are national guidelines followed? *Pediatrics* 2000;106(Suppl):886-96.
- Legorreta AP, Liu X, Zaher CA, Jatulis DE. Variation in managing asthma: experience at the medical group level in California. *Am J Manag Care* 2000;6:445-53.
- Diette GB, Skinner EA, Markson LE, Algatt-Bergstrom P, Nguyen TT, Clark RD, et al. Consistency of care with national guidelines for children with asthma in managed care. *J Pediatr* 2001;138:59-64.
- Tumiel-Berhalter LM, Watkins R. The impact of provider knowledge and attitudes toward national asthma guidelines on self-reported implementation of guidelines. *J Asthma* 2006;43:625-8.
- Rastogi D, Shetty A, Neugebauer R, Harijith A. National Heart, Lung, and Blood Institute guidelines and asthma management practices among inner-city pediatric primary care providers. *Chest* 2006;129:619-23.
- Wisnivesky JP, Lorenzo J, Lyn-Cook R, Newman T, Aponte A, Kiefer E, et al. Barriers to adherence to asthma management guidelines among inner-city primary care providers. *Ann Allergy Asthma Immunol* 2008;101:264-70.

16. Wiener-Ogilvie S, Pinnock H, Huby G, Sheikh A, Partridge MR, Gillies J. Do practices comply with key recommendations of the British Asthma Guideline? If not, why not? *Prim Care Respir J* 2007;16:369-77.
17. Allen FC, Vargas PA, Kolodner K, Eggleston P, Butz A, Huss K, et al. Assessing pediatric clinical asthma practices and perceptions: a new instrument. *J Asthma* 2000;37:31-42.
18. McMullen A, Yoos HL, Anson E, Kitzmann H, Halterman JS, Arcoletto KS. Asthma care of children in clinical practice: do parents report receiving appropriate education? *Pediatr Nurs* 2007;33:37-44.
19. Boulet L-P, Devlin H, O'Donnell DE. The Physicians' Practice Assessment Questionnaire on asthma and COPD. *Respir Med* 2011;105:8-14.
20. Van Ganse E, Texier N, Dima AL, Laforest L, Ferrer M, Hernandez G, et al. Assessment of the safety of long-acting β_2 -agonists in routine asthma care: the ASTRO-LAB protocol. *NPJ Prim Care Respir Med* 2015;25:15040.
21. Doran T, Kontopantelis E, Valderas JM, Campbell S, Roland M, Salisbury C, et al. Effect of financial incentives on incentivised and non-incentivised clinical activities: longitudinal analysis of data from the UK Quality and Outcomes Framework. *BMJ* 2011;342:d3590.
22. Khunti K, Gadsby R, Millett C, Majeed A, Davies M. Quality of diabetes care in the UK: comparison of published quality-of-care reports with results of the Quality and Outcomes Framework for Diabetes. *Diabet Med* 2007;24:1436-41.
23. Rodwin VG. The health care system under French National Health Insurance: lessons for health reform in the United States. *Am J Public Health* 2003;93:31-7.
24. Ricketts T, Naiditch M, Bourgueil Y. Advancing primary care in France and the United States parallel opportunities and barriers. *J Prim Care Community Health* 2012;3:221-5.
25. Orrell-Valente JK, Jones K, Manasse S, Thyne SM, Shenkin BN, Cabana MD. Children's and parents' report of asthma education received from physicians. *J Asthma* 2011;48:831-8.
26. de Bruin M, Viechtbauer W, Hospers HJ, Schaalma HP, Kok G. Standard care quality determines treatment outcomes in control groups of HAART-adherence intervention studies: implications for the interpretation and comparison of intervention effects. *Health Psychol* 2009;28:668-74.
27. de Bruin M, Viechtbauer W, Schaalma HP, Kok G, Abraham C, Hospers HJ. Standard care impact on effects of highly active antiretroviral therapy adherence interventions: a meta-analysis of randomized controlled trials. *Arch Intern Med* 2010;170:240-50.
28. Vignon Zomahoun HT, de Bruin M, Guillaumie L, Moisan J, Grégoire J-P, Pérez N, et al. Effectiveness and content analysis of interventions to enhance oral antidiabetic drug adherence in adults with type 2 diabetes: systematic review and meta-analysis. *Value Health* 2015;18:530-40.
29. Lu M, Safren SA, Skolnik PR, Rogers WH, Coady W, Hardy H, et al. Optimal recall period and response task for self-reported HIV medication adherence. *AIDS Behav* 2008;12:86-94.
30. Ajzen I. Theories of cognitive self-regulation. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50:179-211.
31. Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: a meta-analytic review. *Br J Soc Psychol* 2001;40:471-99.
32. R Core Team. R: A Language and Environment for Statistical Computing [Internet]. Vienna, Austria; 2013. Available from: <http://www.R-project.org>.
33. van der Ark LA. Mokken scale analysis in R. *J Stat Softw* 2007;20:1-19.
34. Sijtsma K. Methodology review: nonparametric IRT approaches to the analysis of dichotomous item scores. *Appl Psychol Meas* 1998;22:3-31.
35. Hemker BT, Sijtsma K, Molenaar IW. Selection of unidimensional scales from a multidimensional item bank in the polytomous Mokken IRT model. *Appl Psychol Meas* 1995;19:337-52.
36. Meijer RR. The number of Guttman errors as a simple and powerful person-fit statistic. *Appl Psychol Meas* 1994;18:311-4.
37. Meijer RR, Niessen ASM, Tendeiro JN. A practical guide to check the consistency of item response patterns in clinical research through person-fit statistics examples and a computer program. *Assessment* 2016;23:52-62.

ONLINE REPOSITORY

TABLE E1. Sources for the items on asthma care

No.	Content	Type	Sources
1	Perform or refer to repeated lung function tests (eg, spirometry, or peak flow) with patients over 8 y old	Medical	QOF ^{E1} ; BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E5-E7}
2	Question patients to identify asthma triggers	Medical	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4}
3	Assess smoking status for patients over 13 y old	Medical	BTS/SIGN ^{E2} ; QOF ^{E1}
4	Assess smoking status of coinhabitants (parents, partner, and roommate)	Medical	BTS/SIGN ^{E2} ; NAEPP ^{E4} ; ^{E5,E8,E9} ; (adapted)
5	Perform or refer to allergy testing	Medical	NAEPP ^{E4} ; ^{E6,E10}
6	Assess comorbid conditions (eg, obesity, rhinitis, or depression) and prescribe treatment if needed	Medical	NAEPP ^{E4} ;
7	Explain the difference between asthmatic and normal airways	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; ^{E9,E11} ; (adapted)
8	Explain what happens to the lungs during an asthma attack	Adherence support	BTS/SIGN ^{E2} ; ^{E9,E11} ; (adapted)
9	Explain what their medication does to control asthma	Adherence support	BTS/SIGN ^{E2} ; ^{E9,E11} ; (adapted)
10	Explain the difference between preventer and reliever medication	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ;
11	Explain common side effects and how to deal with them	Adherence support	^{E11}
12	Discuss with patients how they can monitor their asthma control using symptom diaries or a peak flow meter	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E6,E8-E10,E12} ; (adapted)
13	Discuss how to avoid or manage triggers	Medical	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E5,E6,E9,E12} ; (adapted)
14	Discuss what to do in case of worsening symptoms or an asthma attack	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E5,E6,E9} ; (adapted)
15	Discuss with patients which inhaler device they prefer to use	Adherence support	BTS/SIGN ^{E2}
16	Ask patients if they have any concerns about using their inhaler medication as prescribed	Adherence support	GINA ^{E3} ; NAEPP ^{E4} ; ^{E5,E9,E11}
17	Discuss the importance of taking the inhaler medication as prescribed for achieving asthma control	Adherence support	^{E11} ; (adapted)
18	Discuss the risks of not taking inhaler medication regularly or stopping treatment	Adherence support	^{E11} ; (adapted)
19	Together with the patients discuss an individualized plan of where, when, and how to take their medication	Adherence support	^{E11} ; (adapted)
20	Ask patients to identify daily routines (eg, brushing teeth) to remember to use inhaler medication at these times	Adherence support	^{E11} ; (adapted)
21	Encourage patients to use reminders (eg, an alarm) to remember their inhaler medication use	Adherence support	BTS/SIGN ^{E2} ; ^{E11} ; (adapted)
22	Plan storing spare asthma inhalers at strategic places (office, car, school)	Adherence support	^{E11} ; (adapted)
23	Discuss common barriers to taking inhaler medication as prescribed (adherence), and how to deal with these	Adherence support	^{E11} ; (adapted)
24	Develop with patients a written action plan detailing medication intake instructions that they can follow at home	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E5-E7,E9-E11}
25	Ask patients how confident they feel in their ability to take the inhaler medication as advised	Adherence support	^{E11} ; (adapted)
26	Practice how to use inhalers	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E5,E6,E9} ; (adapted)
27	Use a validated set of questions to assess symptoms	Medical	QOF ^{E1} ; BTS/SIGN ^{E2}
28	Step-up treatment if patients have poor asthma control	Medical	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4}
29	Ask patients to show how they use their inhaler	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4}
30	Ask patients whether they have always taken their inhaler medication as prescribed since their last visit	Adherence support	BTS/SIGN ^{E2} ; GINA ^{E3} ; NAEPP ^{E4} ; ^{E11} ; (adapted)

(continued)

TABLE E1. (Continued)

No.	Content	Type	Sources
31	Ask patients whether they have been able to avoid or manage relevant asthma triggers	Medical	GINA ^{E3} ; NAEPP ^{E4}
32	Delay stepping-up treatment when patients display poor adherence, or inaccurate inhaler use	Medical	NAEPP ^{E4}
33	Refer to an asthma specialist if patients have difficulties in achieving or maintaining asthma control	Medical	NAEPP ^{E4}
34	Encourage patients who you perceive as having good adherence	Adherence support	E11; (adapted)
35	If patients report adherence difficulties, discuss what can be done to overcome these	Adherence support	GINA ^{E3} ; E9,E11; (adapted)
36	Inquire about side effects and discuss how these can be managed if present	Adherence support	E11
37	Ask patients with poor asthma control to come more frequently to the clinic	Adherence support	GINA ^{E3} ; E11; (adapted)

BTS, British Thoracic Society; GINA, Global Initiative for Asthma; NAEPP, National Asthma Education and Prevention Program; QOF, Quality and Outcomes Framework; SIGN, Scottish Intercollegiate Guidelines Network.

TABLE E2. Pearson *r* correlations of background and asthma care variables

	Amount self-management support	Amount medical care	Consistency self-management support (lack of)	Consistency medical care (lack of)	Gender	Age	Country	Specialty	Years of experience	Frequency reviews	Caseload	Minutes consultation	Asthma university studies	Asthma ongoing professional development	Patient education university studies	Patient education ongoing professional development	Attitudes	Subjective norms
Amount medical care	0.54***																	
Consistency self-management support (lack of)	−0.57***	−0.34***																
Consistency medical care (lack of)	−0.30***	−0.58***	0.18**															
Gender	0.17**	0.07	−0.10	−0.09														
Age	0.10	0.14*	−0.11#	−0.14*	−0.14*													
Country	0.28***	−0.08	−0.18**	0.12*	0.25***	−0.15*												
Specialty	−0.46***	−0.16**	0.30***	0.05	−0.53***	−0.03	−0.55***											
Years of experience	−0.04	0.02	−0.03	−0.04	−0.30***	0.75***	−0.18**	0.27***										
Frequency reviews	0.20***	−0.07	−0.12*	0.15*	0.23***	−0.06	0.67***	−0.43***	−0.12*									
Caseload	0.22***	0.03	−0.15*	0.09	0.06	−0.04	0.47***	−0.30***	−0.03	0.31***								
Minutes consultation	0.10	0.18**	−0.02	−0.19**	0.22***	0.13*	−0.46***	−0.15**	−0.02	−0.26***	−0.17**							
Asthma university studies	0.18**	0.17**	−0.06	−0.02	−0.02	−0.08	0.21***	−0.10	−0.04	0.03	0.03	−0.06						
Asthma ongoing professional development	0.15*	0.03	−0.02	0.06	−0.08	0.22***	0.23***	−0.04	0.31***	0.15*	0.21***	−0.13*	0.05					
Patient education university studies	0.11#	−0.04	−0.05	0.02	−0.01	−0.25***	0.38***	0.04	−0.14*	0.17**	0.13*	−0.36***	0.31***	0.05				
Patient education ongoing professional development	0.08	0.04	−0.05	0.04	−0.07	0.08	0.01	0.11#	0.18**	0.02	−0.05	−0.02	0.11#	0.29***	0.06			
Attitudes	0.38***	0.32***	−0.23***	−0.23***	0.24***	0.06	0.08	−0.34***	−0.08	0.07	0.09	0.22***	0.08	−0.01	−0.05	−0.07		
Subjective norms	0.49***	0.30***	−0.35***	−0.19**	0.19**	0.12#	0.30***	−0.39***	0.00	0.16**	0.19**	−0.01	0.13*	0.11#	0.05	0.02	0.64***	
Perceived behavioral control	0.41***	0.33***	−0.29***	−0.26***	0.16**	0.07	0.16**	−0.35***	−0.04	0.09	0.15*	0.12#	0.06	0.01	−0.01	−0.10#	0.53***	0.56***

#*P* < .10, **P* < .05, ***P* < .01, ****P* < .001.

TABLE E3. MSA aisp algorithm at increasing homogeneity thresholds for medical care items—France (n = 156)

Items	Homogeneity threshold											
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
Perform or refer to repeated lung function tests (eg, spirometry, or peak flow) with patients over 8 y old	1	1	1	1	1	1	1	1	1	0	0	0
Question patients to identify asthma triggers	0	0	0	0	0	0	0	0	0	0	0	0
Assess smoking status of coinhabitants (parents, partner, and roommate)	0	0	0	0	0	0	0	0	0	0	0	0
Perform or refer to allergy testing	1	1	1	1	1	1	1	1	1	0	0	0
Assess comorbid conditions (eg, obesity, rhinitis, or depression) and prescribe treatment if needed	2	2	2	2	0	0	0	0	0	0	0	0
Discuss how to avoid or manage triggers	2	2	2	2	2	2	2	2	0	0	0	0
Use a validated set of questions to assess symptoms	0	0	0	0	0	0	0	0	0	0	0	0
Delay stepping-up treatment when patients display poor adherence, or inaccurate inhaler use	2	2	2	2	2	2	2	2	0	0	0	0
Refer to an asthma specialist if patients have difficulties in achieving or maintaining asthma control	0	0	0	0	0	0	0	0	0	0	0	0

MSA, Mokken scaling analyses.

TABLE E4. MSA aisp algorithm at increasing homogeneity thresholds for medical care items—UK (n = 120)

Items	Homogeneity threshold											
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
Perform or refer to repeated lung function tests (eg, spirometry, or peak flow) with patients over 8 y old	2	2	2	2	2	2	2	2	0	0	0	0
Question patients to identify asthma triggers	1	1	1	1	1	1	1	1	1	0	0	0
Assess smoking status of co-inhabitants (parents, partner, and roommate)	1	1	1	1	1	1	1	1	0	0	0	0
Perform or refer to allergy testing	1	1	1	1	1	1	1	1	0	0	0	0
Assess comorbid conditions (eg, obesity, rhinitis, or depression) and prescribe treatment if needed	2	2	2	2	2	2	2	2	0	0	0	0
Discuss how to avoid or manage triggers	1	1	1	1	1	1	1	1	1	1	1	1
Use a validated set of questions to assess symptoms	0	0	0	0	0	0	0	0	0	0	0	0
Delay stepping-up treatment when patients display poor adherence, or inaccurate inhaler use	1	1	1	1	1	1	1	1	1	1	1	1
Refer to an asthma specialist if patients have difficulties in achieving or maintaining asthma control	0	0	0	0	0	0	0	0	0	0	0	0

MSA, Mokken scaling analyses.

TABLE E5. MSA aisp algorithm at increasing homogeneity thresholds for self-management support items—France (n = 156)

Items	Homogeneity threshold											
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
Explain the difference between asthmatic and normal airways	1	1	1	1	1	1	1	1	1	1	1	1
Explain what happens to the lungs during an asthma attack	1	1	1	1	1	1	1	1	1	1	1	1
Explain what their medication does to control asthma	1	1	1	1	1	1	1	1	1	1	1	1
Explain common side effects and how to deal with them	1	1	1	1	1	4	4	4	4	4	4	4
Discuss with patients how they can monitor their asthma control using symptom diaries or a peak flow meter	2	2	2	0	4	0	0	0	0	0	0	0
Discuss with patients which inhaler device they prefer to use	2	2	2	2	2	0	0	0	0	0	0	0
Ask patients if they have any concerns about using their inhaler medication as prescribed	2	2	2	2	2	2	2	2	2	2	2	2
Discuss the importance of taking the inhaler medication as prescribed for achieving asthma control	1	1	1	1	3	3	3	3	3	3	3	3
Discuss the risks of not taking inhaler medication regularly or stopping treatment	0	0	0	0	3	3	3	3	3	3	3	3
Together with the patients discuss an individualized plan of where, when and how to take their medication	1	1	1	1	1	4	4	4	0	0	0	0
Ask patients to identify daily routines (eg, brushing teeth) to remember to use inhaler medication at these times	1	1	1	1	1	1	1	5	5	0	0	0
Encourage patients to use reminders (eg, an alarm) to remember their inhaler medication use	1	1	1	1	1	1	1	5	5	0	0	0
Plan storing spare asthma inhalers at strategic places (office, car, school)	0	0	0	0	0	0	0	0	0	0	0	0
Discuss common barriers to taking inhaler medication as prescribed (adherence), and how to deal with these	1	1	1	1	1	1	5	0	0	5	5	0
Develop with patients a written action plan detailing medication intake instructions that they can follow at home	1	1	1	1	1	1	1	1	1	5	5	0
Ask patients how confident they feel in their ability to take the inhaler medication as advised	1	1	1	1	1	2	2	2	2	2	2	0
Practice how to use inhalers	2	2	2	2	2	2	2	2	0	0	0	0
Ask patients to show how they use their inhaler	1	1	1	1	2	2	2	2	2	2	2	2
Ask patients whether they have always taken their inhaler medication as prescribed since their last visit	1	1	1	1	1	1	0	0	0	0	0	0
Encourage patients who you perceive as having good adherence	1	1	1	1	1	1	5	5	0	0	0	0
If patients report adherence difficulties, discuss what can be done to overcome these	1	1	1	1	1	4	4	4	0	0	0	0
Inquire about side effects and discuss how these can be managed if present	1	1	1	1	1	4	4	4	4	4	4	4
Ask patients with poor asthma control to come more frequently to the clinic	2	2	2	0	4	0	0	0	0	0	0	0

MSA, Mokken scaling analyses.

TABLE E6. MSA aisp algorithm at increasing homogeneity thresholds for self-management support items—UK (n = 120)

Items	Homogeneity threshold											
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
Explain the difference between asthmatic and normal airways	1	1	1	1	1	0	3	3	0	0	0	0
Explain what happens to the lungs during an asthma attack	1	1	1	1	1	1	3	3	0	0	0	0
Explain common side effects and how to deal with them	1	1	1	1	1	1	1	1	2	2	2	3
Discuss with patients how they can monitor their asthma control using symptom diaries or a peak flow meter	1	1	1	1	2	2	4	0	0	0	0	0
Discuss with patients which inhaler device they prefer to use	1	1	1	1	1	1	1	1	1	1	1	1
Ask patients if they have any concerns about using their inhaler medication as prescribed	1	1	1	1	1	1	1	1	3	3	3	4
Discuss the risks of not taking inhaler medication regularly or stopping treatment	1	1	1	1	1	1	2	2	4	4	0	0
Together with the patients discuss an individualized plan of where, when, and how to take their medication	1	1	1	1	1	1	1	1	1	1	1	1
Ask patients to identify daily routines (eg, brushing teeth) to remember to use inhaler medication at these times	1	1	1	1	1	1	1	1	1	1	0	2
Encourage patients to use reminders (eg, an alarm) to remember their inhaler medication use	1	1	1	1	1	1	1	1	1	1	1	2
Plan storing spare asthma inhalers at strategic places (office, car, school)	1	1	1	1	2	2	4	0	0	0	0	0
Discuss common barriers to taking inhaler medication as prescribed (adherence), and how to deal with these	1	1	1	1	1	1	1	1	1	1	0	0
Develop with patients a written action plan detailing medication intake instructions that they can follow at home	1	1	1	1	1	1	1	1	1	1	1	1
Ask patients how confident they feel in their ability to take the inhaler medication as advised	1	1	1	1	1	1	1	2	3	3	3	4
Practice how to use inhalers	1	1	1	1	1	1	1	4	1	0	0	0
Ask patients to show how they use their inhaler	1	1	1	1	1	1	1	1	1	1	1	2
Ask patients whether they have always taken their inhaler medication as prescribed since their last visit	1	1	1	1	1	1	2	2	4	4	0	0
Encourage patients who you perceive as having good adherence	1	1	1	1	1	1	1	1	0	0	0	0
If patients report adherence difficulties, discuss what can be done to overcome these	1	1	1	1	1	1	1	1	1	1	1	1
Inquire about side effects and discuss how these can be managed if present	1	1	1	1	1	1	1	4	2	2	2	3

MSA, Mokken scaling analyses.

TABLE E7. Sample characteristics for French and UK general practitioners (GPs) and UK nurses

Characteristic	France GPs (n = 156)	UK GPs (n = 68)	UK nurses (n = 52)	Group differences		
				1-2	1-3	2-3
Gender (women)	53 (33.97%)	19 (27.94%)	52 (100%)	1.35 (1)	NA*	NA*
Age						
Less than 30 y	0 (0%)	3 (4.41%)	0 (0%)	0.007	0.1	0.094
30 to 39 y	26 (16.67%)	19 (27.94%)	7 (13.46%)			
40 to 49 y	42 (26.92%)	21 (30.88%)	18 (34.62%)			
50 to 59 y	73 (46.79%)	21 (30.88%)	24 (46.15%)			
60 y and over	15 (9.62%)	4 (5.88%)	3 (5.77%)			
Years of experience in asthma care						
Less than 5 y	10 (6.41%)	6 (8.82%)	9 (17.31%)	1	<0.001	0.001
5 to 9 y	21 (13.46%)	9 (13.24%)	11 (21.15%)			
10 to 19 y	45 (28.85%)	19 (27.94%)	23 (44.23%)			
20 to 29 y	55 (35.26%)	26 (38.24%)	9 (17.31%)			
30 y and above	25 (16.03%)	8 (11.76%)	0 (0%)			
Asthma-specific training						
During university studies	110 (70.5%)	61 (89.7%)	45 (86.5%)	0.006	0.08	0.1
Ongoing professional development	94 (60.3%)	60 (88.2%)	38 (73.1%)	<0.001	0.402	0.165
Communication-specific training						
During university studies	58 (37.2%)	65 (95.6%)	26 (50.00%)	<0.001	0.32	<0.001
Ongoing professional development	115 (73.7%)	56 (82.4%)	33 (63.5%)	0.528	0.487	0.066

Note: group differences are tested with Wilcoxon for ordinal and Fisher's exact for categorical variables.

*No test statistic could be produced as 100% of the nurses were female.

REFERENCES

- E1. NHS Employers and the General Practitioners Committee BMA. Quality and Outcomes Framework for 2012/13: Guidance for PCOs and practices. London: BMA and NHS Employers; 2012.
- E2. British Thoracic Society Scottish Intercollegiate Guidelines Network. British guideline on the management of asthma. Thorax 2008;63(Suppl 4):iv1-v121.
- E3. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. Eur Respir J 2008;31:143-78.
- E4. National Heart, Lung, and Blood Institute. National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma—full report. Bethesda, MA: National Heart, Lung, and Blood Institute; 2007.
- E5. Allen FC, Vargas PA, Kolodner K, Eggleston P, Butz A, Huss K, et al. Assessing pediatric clinical asthma practices and perceptions: a new instrument. J Asthma 2000;37:31-42.
- E6. Diette GB, Skinner EA, Markson LE, Algatt-Bergstrom P, Nguyen TT, Clark RD, et al. Consistency of care with national guidelines for children with asthma in managed care. J Pediatr 2001;138:59-64.
- E7. Wiener-Ogilvie S, Pinnock H, Huby G, Sheikh A, Partridge MR, Gillies J. Do practices comply with key recommendations of the British Asthma Guideline? If not, why not? Prim Care Respir J 2007;16:369-77.
- E8. Cabana MD, Rand CS, Becher OJ, Rubin HR. Reasons for pediatrician non-adherence to asthma guidelines. Arch Pediatr Adolesc Med 2001;155:1057-62.
- E9. McMullen A, Yoos HL, Anson E, Kitzmann H, Halterman JS, Arcoleo KS. Asthma care of children in clinical practice: do parents report receiving appropriate education? Pediatr Nurs 2007;33:37-44.
- E10. Wisnivesky JP, Lorenzo J, Lyn-Cook R, Newman T, Aponte A, Kiefer E, et al. Barriers to adherence to asthma management guidelines among inner-city primary care providers. Ann Allergy Asthma Immunol 2008;101:264-70.
- E11. de Bruin M, Viechtbauer W, Hospers HJ, Schaalma HP, Kok G. Standard care quality determines treatment outcomes in control groups of HAART-adherence intervention studies: implications for the interpretation and comparison of intervention effects. Health Psychol 2009;28:668-74.
- E12. Legorreta AP, Liu X, Zaher CA, Jatulis DE. Variation in managing asthma: experience at the medical group level in California. Am J Manag Care 2000;6:445-53.