Eur Arch Psychiatry Clin Neurosci (2014) 264:171–178
DOI 10.1007/s00406-013-0416-1

ORIGINAL PAPER

A composite scale applied to evaluate anxiety in schizophrenic patients (SAES)

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Received: 22 February 2013 / Accepted: 31 May 2013 / Published online: 15 June 2013

Abstract Anxiety in schizophrenia possesses specific features and is difficult to assess because no specific evaluating tool is currently available. The aim of this study was to develop and validate a hetero-assessment-based scale to specifically measure anxiety in schizophrenia. A literature review and a survey among psychiatrists allowed the selection of 29 items from 4 previous scales evaluating anxiety. Factor analysis allowed building up a final 22-item composite scale of anxiety evaluation in schizophrenia (SAES), which was then validated in 147 schizophrenic patients. One hundred and forty-seven (147) schizophrenic patients (70.8 % male, mean age = 36.9 years) were included in the study. Principal component analysis of the SAES revealed three factors, namely "expressed and perceived anxiety," "somatic anxiety," and "anxiety and environment". All total and factor scores of the SAES were significantly correlated ($p < .001$) with total and factor scores of the original scales. Finally, the SAES showed good inter-rater reliability [intra-class correlation coefficient (ICC) = .82]. In conclusion, a specific tool for evaluating anxiety in schizophrenia (SAES) was developed and validated in a sample of schizophrenic patients. The SAES can be useful to investigate clinical, psychopathological, and therapeutic aspects of anxiety in schizophrenia.

Keywords Schizophrenia · Anxiety · Scale · Validity · Reliability

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Introduction

Anxiety is frequently observed in schizophrenia [1]. It constitutes one major manifestation of the prodromal phase of schizophrenia (together with social withdrawal) [2–5]. In the course of the illness, anxiety increases the risk of relapse [6, 7], the incidence of suicide attempts [8], aggravates cognitive deficits [9–13], social stigma [14], functioning [15], and quality of life [5, 9, 16–18] and seems associated with paranoia [19].

Previous studies have evaluated anxiety in schizophrenia as part of broad symptom studies [using the positive and negative syndrome scale of schizophrenia (PANSS), or the Brief Psychiatric Rating Scale (BPRS)] or from anxiety scales developed in non-schizophrenic populations such as the Hamilton Anxiety Scale (HAM-A). However, anxiety in schizophrenia possesses specific features [20–22]:

- It is more silent and intense, as it is in mood disorders or in other anxiety disorders
- It is accompanied by psychomotor disturbances such as agitation and languor
- It has less somatic impact

Therefore, it requires assessment with specific scales.

Blin et al. [23] developed the Psychotic Anxiety Scale (PAS) designed to specifically evaluate anxiety in psychotic patients. The PAS has been used to evaluate the anxiolytic effects of zuclopenthixol [24] and risperidone [25]. However, the authors themselves reported a low inter-rater reliability for 3 of the 18 items. They decided to modify the scale [23], but the validation of this new version has never been published, and it cannot be considered as a useful tool for clinicians.

Anxiety in schizophrenia is an important factor to evaluate in clinical trials. Moreover, its evaluation may facilitate psychopathological studies dealing with the place of anxiety in the etiopathogenesis of schizophrenia.

Based on the above arguments, we decided to develop a specific scale to evaluate anxiety in schizophrenia scale of anxiety evaluation in schizophrenia (SAES). The SAES was then tested for validity and reliability in a sample of 147 schizophrenic patients.

Methods

Construction of the scale

Several of the authors (PML, FJB, CL) performed a Medline search to find tools specifically designed to evaluate anxiety. The selection criterion was the consensus on the clinical relevance of the scales, based on validation studies, the literature references, and personal experience. Then, the authors compared the items of three different scales: the HAM-A [26], the Tyrer's Brief Scale for anxiety (BSA) [27] and the AMDP-AT Anxiety Scale [28], together with those on the Comprehensive Psychopathological Rating Scale (CPRS) [29]. French-validated versions of these anxiety scales were used [30–33]. Redundant items among those supposed to assess the same symptom were removed; the item conserved was the one considered as the more explicit, by the consensus of the authors. The following set of 29 anxiety items was selected on the basis of their clinical relevance, validation studies, experience, and absence of overlap between items (see Table 1):

- Twelve out of the 14 items on the HAM-A (items #6 and 12 were excluded and item #14 was divided in two)
- Nine out of the 10 items on the BSA (item #6 was excluded)
- Twelve out of the 17 items on the AMDP-AT (items #2, 5, 8, 15, and 17 were excluded)
- Five items (#10, 13, 16, 27, and 28) from the CPRS.

Repetitious items were deleted. For items evaluating the same symptom, the most explicit item was retained following consensus among the investigators. A 5-level severity scale was developed as a function of the presence or absence of a given symptom, its intensity, its frequency, and its degree of interference with functioning, i.e.: 1: absent or doubtful, 2: minimal, 3: moderate, 4: severe, and 5: extreme.

Table 1 The SAES (29 items)

Item	Scale of origin	Symptom
1	**HAM-A 1, AMDP 1**	**Anxious mood**
2	**HAM-A 2**	**Tension**
3	**HAM-A 3**	**Fears**
4	**AMDP 3**	**Anxious anticipation**
5	**BSA 1**	**Paroxystic anxiety**
6	**AMDP 16**	**Anxious perplexity**
7	HAM-A 4, BSA 5, AMDP 14	Insomnia
8	HAM-A 5, CPRS 16	Intellectual insight
9	**HAM-A 7, BSA 10**	**Somatic complaint: muscular**
10	**HAM-A 8**	**Somatic complaint: sensory**
11	**HAM-A 9**	**Cardiovascular symptoms**
12	**HAM-A 10**	**Respiratory symptoms**
13	**HAM-A 11**	**Gastrointestinal symptoms**
14	**HAM-A 13, BSA 7 and 9**	**Autonomic symptoms**
15	**HAM-A 14**	**Behavior at interview**
16	**HAM-A 14**	**Physical symptoms at interview**
17	**BSA 8**	**Pain complaints**
18	BSA 2—AMDP-AT 9	Irritability
19	BSA 2 – AMDP-AT 9	Hostility, aggression
20	**BSA 3**	**Hypochondria**
21	AMDP-A 10	Hyperemotivity
22	**CPRS 13**	**Indecision**
23	**CPRS 10**	**Obsessive thinking**
24	CPRS 10	Compulsions
25	**BSA 4, AMDP 5**	**Phobias**
26	**BSA 5, AMDP 4**	**Worries for trivialities**
27	**AMDP 6**	**Social anxiety**
28	**CPRS 27**	**Derealization**
29	CPRS 28	Depersonalization

Full scale available from corresponding author

The items retained after item selection are in bold

General rating scale 1: absent or doubtful, 2: minimal, 3: moderate, 4: severe, 5: extreme

HAM-A: Hamilton Anxiety Scale (Hamilton [26]). Tyrer: Tyrer's Brief Scale for anxiety (Tyrer et al. [27]). AMDP: Bobon's AMDP-AT Anxiety Scale (Bobon et al. [33]). CPRS: Comprehensive Psychopathological Rating Scale (Asberg et al. [29])

Content validity

Selected items evaluating each symptom were incorporated into a Likert-formatted questionnaire [34]. The pertinence,

reliability, and limitations of this questionnaire were evaluated by a group of independent psychiatrists—experts in the field of psychometric research, anxiety evaluation, and schizophrenia—using the Delphi method [35] (see list of psychiatrists in Acknowledgments section).

A guide was added specifying that a clinician should fulfill the SAES in a single session. Each symptom was scored from 1 to 5 using three symptom criteria: frequency (occasional/often/very frequent/permanent), intensity (based on patient's personal experience), and interference with functioning (functional handicap). A description was given for each symptom investigated, and rating criteria were suggested. The evaluation period covered the time of the interview and the preceding week. To check that the instruction items and response scale were well understood, a rating of 1 ("absent or doubtful") was given when the patient was unable to respond to the questions or if the answers to parts of a question were doubtful. Finally, ratings were always "rounded up," i.e.: when symptom frequency was quoted as "often" and the level of intensity as "extreme," a rating of 5 (extreme) was given.

Scale validation in schizophrenic patients

To validate the SAES (French version), a multicentre, cross-sectional study was conducted in schizophrenic patients from March to August 2007. Five French psychiatric settings participated in the study:

- Psychiatry Service, CHU of Clermont-Ferrand (Clermont-Ferrand)
- Psychiatry Service, CHU Sainte Marguerite (Marseille)
- CHU, Hospital Archet (Nice)
- CH Saint-Anne (Paris)
- CH Sainte Marie, Clermont-Ferrand (Clermont-Ferrand)

Adult French-speaking patients (18–65 years old), meeting DSM-IV criteria for schizophrenia or schizoaffective disorder, were eligible for inclusion. No specifications were given concerning pharmacological or non-pharmacological treatment. Exclusion criteria were inability to understand instructions, mental retardation, or underlying neurological disorder.

To get a random recruitment and limit inclusion bias, each center was asked to include the first 25–35 patients consulting as outpatients or admitted to the hospital. All patients gave informed consent before being enrolled in the study. The study was conducted according to good clinical practices. All procedures were approved by the local ethics committee.

Raters were trained to administer all rating scales (trainers OB, IdC). Socio-demographic and clinical data were collected for all patients. Following the patient's consent, all scales were rated on the same day.Assessments included the following:

- Anxiety, as evaluated by the SAES and the HAM-A. The HAM-A was divided into two components, called HAMA-PSY and HAMA-PHY (24). The items were split into physical factors (items 7 to 13: HAMA-PHY) and psychic factors (items 1 to 6 and 14) [26, 31]. This scale was used to evaluate the concurrent validity of the SAES scale.
- Four items of the "anxiety/depression" factor of the PANSS are as follows [36]: somatic concern (G1), anxiety (G2), guilt (G3), and depression (G6)
- Symptom severity and general psychopathology as evaluated using the PANSS

Inter-rater reliability was assessed by two independent investigators in a subsample of the population. The time interval between the two evaluations did not exceed 1 week.

Statistical analysis

An exploratory factor analysis (EFA) was performed in two steps. First, a correlation matrix was tested for sample adequacy using the Kaiser–Meyer–Olkin (KMO) index [37]. Then, a principal component analysis (PCA) allowed calculation of eigenvalues and extraction of the number of relevant factors. A parallel analysis was performed, and the scree plot was visually inspected as recommended by Lance et al. [38] as the best method to assess the true number of factors. The resulting pattern matrix was rotated according to the Promax criterion (the product-moment correlation matrix was used because the polychoric correlation matrix was not positive). Based on the priori decision items, factor loadings $\geq .4$ were deemed meaningful, and only the highest factor loading for each item was considered.

The internal consistency of the SAES items was measured with a standardized Cronbach's alpha coefficient.

Concurrent validity for each component was determined by the Pearson correlation coefficient between the SAES and its factors and the other rating scales. A significance level for the correlations was established at $p = .001$ (two-tailed).

Inter-rater concordance was calculated by using the intra-class correlation coefficient (ICC) [39] for the total SAES scores. Rating reliability was taken as acceptable for

Table 2 Characteristics of schizophrenic patients participating in the study ($n = 147$)

Gender (% males)	70.8
Age (years, mean ± SD)	36.9 ± 10.7
Marital status (% of patients)	
Single	83.3
Married	6.2
Cohabiting	7.6
Divorced/separated	2.8
Widowed	0
Working status (% of patients)	
Unemployed	75
Worker	18.6
Student	6.4
Medical care (% of patients)	
Inpatients	27.9
Outpatients	8.8
Partial hospitalization	63.3
Total illness duration (years, mean ± SD)	13.7 ± 9.5
Psychotropic treatments (% of patients)	
Antidepressants	25.3
Second generation antipsychotics	81.5
Neuroleptics	66.4
Benzodiazepines	34.9
Mood stabilizers	13.70 %
Antidepressants + antipsychotics	29.00 %
Clinical evaluation scores (mean ± SD)	
PANSS negative scale	22.2 ± 8.2
PANSS positive scale	16.0 ± 6.4
PANSS General Psychopathology Scale	37.5 ± 10.2
PANSS total score	75.7 ± 21.2
HAM-A total score	9.1 ± 7.30

ICC values >.40, satisfactory for ICC > .60, and highly reliable for ICC > .80.

Results

Socio-demographic and clinical aspects of the included patients

A total of 147 schizophrenic patients were included in the study. Table 2 shows their socio-demographic and clinical characteristics. The included patients were young (mean age = 36.9 years), predominantly male (70.8 %), 75 % were unemployed, and only 13.8 % were married or living in couples. Fifty-four patients were inpatients (full-time or daily), and 93 were outpatients. Average illness duration was 13.7 years. Most patients were treated with antipsychotics. Their PANSS and HAMA-A scores are given in Table 2.

Reliability and factor analysis

First EFA

A first EFA, run with the original 29 items, allowed the extraction of four factors (Table 3). The KMO sampling adequacy index was .844, a value higher than the threshold value of .5 suggested by Kline [40].

Items 7, 8, 21, and 24 had factor loadings <.4 and were therefore excluded (Table 3). In factor-3 (items 22, 28, 29), items 28 and 29 correlated at .783 with factor loadings >.8. In factor-4, items 18 and 19 correlated at .763 with factor loadings >.8. Therefore, factor-3 and factor-4 appeared to be artificial factors. Items 19 and 29 were excluded on the basis of clinical arguments because they presented slightly higher squared multiple correlations. Finally, the six items numbered 7, 8, 21, 24, 19, and 29 were deleted from the original version of the SAES, leading to a final 23-item version.

Second EFA

A second EFA, run with the previous 23 items, allowed the extraction of three factors (Table 3). The KMO sampling adequacy index was .842, a value higher than the threshold value of .5 suggested by Kline [40].

Factor-1 had a stable structure, except for items 18, 26, and 27. Item 18 ("irritability") was deleted due to a factor loading <.4 and the absence of clinical specificity. Item 27 was switched to factor-3 and item 26, which was in factor-1, cross-loaded on factor-1 and factor-3. Clinical arguments prompted us to associate item 26 ("worrying over trifles") with factor-3. Finally, the first factor was called "expressed and perceived anxiety".

Factor-2, describing "somatic anxiety," consisted of items 10–14 plus 17, 20, and 25. Item 25, "phobias," cross-loaded on factor-2 and factor-3. We decided that it was more pertinent in factor-3 ("anxiety and environment"), which comprised items 22, 25, 26, 27, and 28.

Cronbach's alpha coefficients for the composite scores corresponding to each factor and the total SAES were satisfactory (.87, .79, .71, and .89 for factor-1, factor-2, factor-3, and factor-4, respectively). The between-factor correlations were moderate (r from .33 to .52) compared to the correlations between factors and total SAES score (r from .71 to .91).

This second EFA led to a 22-item version of the SAES by deleting item 18 and confirming the stability of most items (in each factor) as compared with the first EFA. Thus, following the two exploratory analyses, a 22-item

Table 3 Factor structure of SAES after Promax rotation

Item	Symptom	1st Exploratory factor analysis						2nd Exploratory factor analysis				
		4 Factor solution—29 items						3 Factor solution—22 items*				
		F1	F2	F3	F4	SMC	Uniqueness	F1	F2	F3	SMC	Uniqueness
1	Anxious mood	**.717**	−.077	.055	.013	.568	.145	**.645**	−.086	.200	.545	.161
2	Tension	**.753**	−.159	−.128	.199	.541	.226	**.777**	−.154	−.032	.522	.274
3	Fears	**.491**	.314	−.127	−.060	.538	.207	**.518**	.293	−.066	.533	.190
4	Anxious anticipation	**.568**	.134	−.071	−.069	.532	.170	**.573**	.118	.0026	.524	.177
5	Paroxystic anxiety	**.556**	.172	−.074	.132	.522	.187	**.614**	.155	−.028	.499	.248
6	Anxious perplexity	**.711**	−.163	.181	.087	.574	.165	**.577**	−.150	.338	.533	.271
7	Insomnia	.201	.236	.021	.154	.273	.547					
8	Intellectual insight	.357	.060	−.015	−.109	.277	.465					
9	Somatic complaint: muscular	**.513**	.201	−.181	.149	.543	.205	**.604**	.183	−.134	.535	.183
10	Somatic complaint: sensory	−.125	**.501**	.340	.058	.362	.453	−.110	**.476**	.276	.341	.409
11	Cardiovascular symptoms	.002	**.736**	−.114	.001	.588	.165	.103	**.705**	−.150	.574	.175
12	Respiratory symptoms	−.172	**.865**	.085	−.064	.623	.155	−.159	**.851**	.079	.618	.120
13	Gastrointestinal symptoms	.071	**.543**	−.195	.047	.457	.265	.111	**.525**	−.108	.405	.314
14	Autonomic symptoms	.153	**.691**	−.111	−.038	.571	.262	.211	**.668**	−.086	.562	.225
15	Behavior at interview	**.788**	−.064	−.012	.123	.661	.109	**.758**	−.074	.142	.654	.085
16	Physical symptoms at interview	**.549**	.135	−.203	.199	.570	.149	**.696**	.113	−.231	.555	.115
17	Pain complaints	.174	**.742**	.058	.007	.463	.250	−.104	**.714**	.027	.447	.255
18	Irritability	.139	.022	.181	**.818**	**.672**	**.087**	.354	.021	.064	.258	.506
19	Hostility, aggression	.055	−.096	.191	**.850**	**.646**	**.106**					
20	Hypochondria	−.074	**.410**	.139	.134	.360	.355	−.034	**.402**	.115	.322	.349
21	Hyperemotivity	.372	.182	.156	.061	.427	.339				.	
22	Indecision	.326	−.006	**.425**	−.120	.403	.336	.075	−.018	**.646**	.385	.315
23	Obsessive thinking	**.574**	.051	.145	−.072	.526	.239	**.503**	.029	.232	.510	.230
24	Compulsions	.323	.304	.025	−.054	.397	.393				.	
25	Phobias	.142	**.400**	.238	−.207	.463	.256	−.062	.397	**.436**	.442	.250
26	Worries for trivialities	**.696**	−.170	.150	−.215	.494	.226	**.433**	−.161	**.437**	.469	.253
27	Social anxiety	**.447**	.011	.240	−.206	.378	.336	.185	.004	**.506**	.345	.360
28	Derealisation	−.043	−.003	**.909**	.163	.723	.059	−.106	−.023	**.731**	.383	.233
29	Depersonalization	.002	−.056	**.832**	.197	.704	.119					

Factor loading values ≥.40 are given in boldface

SMC squared multiple correlation

* Item 18 was deleted in the final SAES scale

scale was finally retained (Table 3). To further describe the relationship with other variables, the scores for each factor or the whole scale were defined as the sum of each item in each factor and for the whole scale.

Concurrent validity

Table 4 shows score and sub-score correlations of the SAES with the PANSS and the HAM-A. All correlation coefficients were highly significant ($p < .001$), showing good concurrent validity of the SAES total and factor scores (Table 4).

Quite high correlations were found between the total SAES score and the total HAM-A score ($r = .791$), the HAMA-PHYS sub-scale score ($r = .605$) and the HAMA-PSY sub-scale score ($r = .789$). The PANSS "anxiety and depression" factor and PANSS item G2 (anxiety) were more highly correlated with SAES factor-1 ($r = .674$ and .685, respectively) than with SAES factor-2 and factor-3.

Highly correlated measures were found between factors belonging to the same clinical concept (somatic anxiety or psychic anxiety), especially for factor-1 and factor-2. The correlation between factor-1 and HAMA-PSY was in the same range as the correlation between factor-2 and

Table 4 Correlations of SAES factor and total scores with different HAM-A and PANSS scores and sub-scores

	SAES scores				HAM-A scores			PANSS	
	Factor-1	Factor-2	Factor-3	Total	PHYS	PSY	Total	ADF	IG2A
SAES factor-1	1	.476	.519	.913	.482	.774	.721	.674	.685
SAES factor-2		1	.327	.708	.775	.516	.707	.354	.475
SAES factor-3			1	.726	.218	.513	.425	.359	.407
SAES total				1	.605	.789	.791	.630	.690
HAMA-PHYS					1	.590	.866	.491	.526
HAMA-PSY						1	.915	.730	.741
HAMA total score							1	.474	.723
PANNS ADF								1	.818
PANSS IG2A									1

SAES factor-1, perceived and expressed anxiety. SAES factor-2, somatic anxiety. SAES factor-3, anxiety and environment

PANSS ADF, anxiety and depression factor. PANSS IG2A, item G2 "anxiety"

All correlation coefficients were highly significant ($p < .001$)

HAMA-PHYS ($r = .77$ and .78, respectively); factor-3's total score was significantly correlated, although with lower values, with HAMA-PSY and HAMA-PHYS sub-scores ($r = .51$ and .22, respectively).

Discriminant validity

Weak correlations were found between SAES factors and item G6 (from .23 to .40), establishing a discriminant validity of the SAES with depression evaluated with a single item. Even weaker correlations were found between SAES factors and psychotic symptoms (from .14 to .21).

Inter-rater reliability

Inter-rater reliability was evaluated on 17 patients. Pharmacological treatment and hospitalization status were identical between the two evaluations. Intra-class correlation coefficients were calculated for total and factor SAES scores. The SAES showed good inter-rater reliability [intra-class correlation coefficient (ICC) = .82]. Factor-1, factor-2 and factor-3 showed lower, but satisfactory inter-rater reliability (.80, .69, and .71, respectively).

Discussion

We developed a 22-item anxiety scale (SAES) that was analyzed for factor structure and validated in 147 schizophrenic patients. The SAES differs from other scales used to assess schizophrenia, like the PANSS [41], by focusing on a single clinical dimension: anxiety. It also differs from scales specifically used to assess anxiety, like the HAM-A [26] scale, which were not developed and validated in a population of schizophrenic patients.

The choice of a hetero-evaluation was driven by the specific features of schizophrenia, in which self-questionnaires are less suitable for evaluating psychiatric symptoms. The capacity for perception and expression can be modified in schizophrenia, and the observer may be led to take objective manifestations into account.

While devising this scale, one of the key decisions was to concurrently evaluate symptoms, their severity, and their functional consequences. The SAES is therefore useful to clinicians for measuring this clinical dimension and its consequences, which have an important impact in terms of quality of life.

The scale presents a three-factor structure. The three factors have been termed "somatic anxiety," "expressed and perceived anxiety," and "environment and anxiety".

The "somatic anxiety" and "expressed and perceived anxiety" factors were highly correlated and can be compared with the factors previously described by Pichot in the HAM-A [31]. "Somatic anxiety" includes frequent and not very specific somatic symptoms, which are nevertheless clinically relevant. "Expressed and perceived anxiety" resembles the psychic anxiety described in other anxiety scales; the main difference is that in the SAES this factor identifies "behavioral consequences" and "obsessive ideation". The utility and specificity of these items in this factor warrant replication in another population.

The third factor, named "environment and anxiety," encompasses the items "phobias," "indecision," "worries over trifles," "social anxiety," and "derealization". It corresponds to the anxiety raised by the interaction of the subject with his/her environment, particularly the social

environment. This is an important factor to identify, given the reported consequences of anxiety in schizophrenics (impaired functioning, low quality of life) [42].

Our scale showed good internal consistency and good discriminant validity with respect to psychotic and depression items of the PANSS. One limitation of the study was the small sample used to test inter-rater reliability ($n = 17$). Although inter-rater reliability was satisfactory for factor scores and high for total scores, this parameter should be re-examined in future studies. Another limitation of our study is that we validated the scale in a population of schizophrenic patients with no control over the level of psychotic symptoms and no control over treatment status. The scale therefore should be tried in populations that are different in terms of illness duration, level of positive and negative symptoms, and treatment status (e.g. with or without benzodiazepines). Finally, the stability of the scale remains to be determined, since this validation study did not include multiple test points.

Several studies have examined the effects of antipsychotics on the anxious/depressive cluster extracted from the PANSS [43, 44]. An early positive response seems to be predictive of treatment persistence and is associated with improvement [45]. All these studies evaluated anxiety and depression symptoms together (in a single factor). Some studies have specifically evaluated the effect of antipsychotics on depressive symptoms using the MADRS and CDSS [44, 46–48]. To our knowledge, no antipsychotic or other treatment drug has been tested on anxiety by using a schizophrenia-specific scale.

In conclusion, a specific tool for evaluating anxiety in schizophrenia (SAES) was developed and validated in a sample of schizophrenic patients. The SAES can be useful in investigating the place of anxiety in the etiopathogenesis of schizophrenia, particularly in its prodromal phase, and for testing the potential anxiolytic effects of medicinal drugs.

Acknowledgments We are greatly indebted to J.-D. Guelfi (CMME Saint-Anne, Paris, France), P. Boyer (Paris), J.-P. Lépine (Hôpital Fernand Widal, Paris, France), J. Dalery (UCBL1, EA 3092, CH Le Vinatier, Bron, France) and M. Bourgeois (Bordeaux, France) for their participation in the DELPHI expert group. Funding for this study was provided by Sanofi France. Sanofi France had no special role in the study design or in the collection, analysis, and interpretation of data. Dr Hameg (Sanofi France) contributed to the global study idea and helped complete the paper.

Conflict of interest PM. Llorca has undertaken consultancy for Sanofi and has also received financial support for research studies from Sanofi. O. Blanc, I. de Chazeron, L. Samalin, C. Lancon, H. Caci, F.J. Baylé, and JA Lesturgeon have no conflict of interest in this research.

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