Effect of Sex in Systemic Psoriasis Therapy: Differences in Prescription, Effectiveness and Safety in the BIOBADADERM Prospective Cohort

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The effect of sex on systemic therapy for psoriasis has not been well studied. The aim of this study was to analyse a large multicentre Spanish cohort of 2,881 patients with psoriasis (58.3% males), followed from January 2008 to November 2018, to determine whether sex influences prescription, effectiveness of therapy, and the risk of adverse events. The results show that women are more likely than men to be prescribed biologics. There were no differences between men and women in effectiveness of therapy, measured in terms of drug survival. Women were more likely to develop adverse events, but the difference in risk was small and does not justify different management. Study limitations include residual confounding and the use of drug survival as a proxy for effectiveness.

Key words: gender; sex; gender bias; sex bias; psoriasis; biological therapy; drug prescription; drug safety.

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SIGNIFICANCE

The effect of sex on systemic therapy for psoriasis has not been well studied. The aim of this study was to determine, in a large group of 2,881 patients followed from January 2008 to November 2018, whether sex influences prescription, effectiveness of therapy, or the risk of adverse events. The results show that women were more likely than men to be prescribed systemic therapy. No differences between men and women were found in the effectiveness of therapy. Women were also more likely to experience adverse events, but the difference in risk is small, and does not justify different management.

Sex differences are recognized in medicine (1), and analysis of inequalities in practice care may be based on these differences (1). Sex is usually treated as a potential confounder, ignoring whether results apply to both males and females, and excluding the analysis of differences according to sex itself. While there is increasing interest in developing studies to completely integrate the analysis of sex (2), within dermatology, sex perspective is still an opportunity to identify disparities (3) in order to improve equality and efficiency of care.

Psoriasis affects 2–3% of the general population. Although men and women are equally affected in terms of prevalence (4), sex differences have been observed concerning prescription, and effectiveness and safety of systemic treatment (5–16).

Some studies have shown that men are more frequently treated with systemic and biological drugs than are women, which has been linked to the greater severity of the disease in men (5, 7). Other publications have demonstrated that women and men experience the social and mental impact of psoriasis differently (8, 9). Sex differences are seen in the subjective disease scores for psoriasis, with women achieving worse scores than men, regardless of treatment (6, 10). Various publications have shown that, irrespective of the severity of the disease, women are more prone than men to depressive symptoms, psychological distress and impairment of quality of life (11).

Concerning the safety of systemic therapy in psoriasis, several studies indicate female sex as a predictor for discontinuation of biologic therapy due to a higher frequency of side-effects (6, 12, 13). Nevertheless, these studies have limitations, since many are based on drug survival analyses, which may not be a good instrument for measuring the safety of treatments (14).
In order to identify possible differences concerning systemic psoriatic therapy used in daily practice care by female and male patients, the aim of this study was to compare prescription, effectiveness and safety between the sexes in the BIOBADADERM cohort.

MATERIALS AND METHODS

A detailed description of BIOBADADERM has been published previously (15, 16). Established in 2008 as the Spanish prospective cohort of patients with moderate-to-severe psoriasis receiving systemic therapy, it is aimed at describing long-term safety. All consecutive patients in each centre treated with modern (other than classical) systemic drugs are invited to enter the cohort, as well as the next patient who receives a classical systemic drug (acitretin, cyclosporine, methotrexate). Sixteen dermatology departments, distributed throughout the country, participated in this study. This analysis included all prospective patients from January 2008 through November 2018, excluding patients in combination therapy, due to the difficulty of attributing the results obtained to a single drug.

Adverse events (AE) were collected using the Medical Dictionary for Regulatory Activities (MedDRA). Patients were contacted at least once a year, although more frequent visits were usual as part of standard care. All AE were included in the database if they were serious or led to a change in therapy or to an unplanned healthcare demand. Serious AE (SAE) were those that were life-threatening, required prolonged hospitalization, caused persistent disability or resulted in death. Drug exposure to systemic therapy was measured from the start of treatment to the date of last administration, or to the censor date in patients who were lost to follow-up. Patients who were lost to follow-up were censored at the last visit to the dermatologist.

BIOBADADERM is monthly monitored online, and once a year data is validated by on-site audits. BIOBADADERM was approved by the Hospital 12 de Octubre Ethics Committee (216/07) and patients gave their written informed consent.

Study groups and outcomes

The main exposure was sex: males and females. In addition, systemic treatment was further divided into classical therapies (acitretin, cyclosporine, methotrexate) and modern therapies, including biologic and small molecules (etanercept, infliximab, adalimumab, ustekinumab, secukinumab, ixekizumab and apremilast). The main outcomes were treatment prescription, effectiveness and safety. Prescription was considered as the difference in odds of use of classical compared with modern therapies. Due to the lack of other effectiveness measures, the probability of treatment discontinuation, due to ineffectiveness or remission, under a competing risks scenario, was considered a proxy measure for effectiveness. Safety was measured using relative risks and risk differences for AE.

Statistical analysis

Descriptive data were expressed as absolute numbers and percentages for discrete variables, and as medians and interquartile ranges for continuous variables. Results between males and females were compared using the Pearson’s χ² test or Fisher’s exact test for qualitative variables, and the Wilcoxon–Mann–Whitney test for quantitative variables. For multivariable analysis, individual drugs (not overall categories) were included in the analyses.

Propensity scores

A propensity score (PS) was estimated in order to reduce the selection bias from non-random allocation of treatments in cohort studies. PS was created based on the probability of indication for classical against modern therapies and was obtained by building a logistic regression model, using all variables potentially associated with treatments and outcomes as independent variables (17). PS was incorporated as a confounder in the analysis of all outcomes, except for the analysis of prescription, since the aim of the current study was not to control for the difference in the use of treatments, but to detect it.

Missing values analysis

Most of the variables analysed had no relevant missing data. Some comorbidities had missing data, most ranging between 4% (e.g. hypertension) and 6% (e.g. chronic liver disease). The highest percentage was for alcohol consumption (23%).

Five complete datasets were created by means of chained equations, assuming that missing values were missing at random, using a fully conditional specification model (18). Missing values were imputed using other T individual’s observed variables. Imputed values were examined using iteration to assess convergence and stationarity of each chain. The 5 datasets were analysed using specific regression models for every outcome. Finally, the results of the complete datasets were combined into a single set of estimates using the Rubin rules (19).

Prescription

A nested case-control design with incidence density sampling was used. Prescription was the outcome and sex was the exposure. For this analysis, a multilevel mixed-effects logistic regression model was built to determine the association between modern systemic therapy and sex. The hospital was considered as a random effect, due to within-centre clustering of patients. Firstly, crude results were obtained with univariate regression analysis, using treatment as outcome, sex as exposure, and demographic characteristics (age, body mass index (BMI), smoking and alcohol consumption), clinical characteristics (disease duration, Psoriasis Area and Severity Index (PASI), type of psoriasis and psoriatic arthritis), comorbidities and previous treatments (number of previous systemic classical treatment, previous phototherapy and treatment order) as independent variables. A backward selection multivariate model was then constructed to adjust for confounders, using variables potentially associated with prescription in the univariate model.

Effectiveness

Using the cohort design, survival of first drug was measured as a proxy for effectiveness in a competing risk survival scenario. Competing risks regression models were used to compare every specific subhazard ratio (SHR) for ineffectiveness or remission (similarly interpreted to hazard ratios in Cox regression) and cumulative incidence functions (CIF) of discontinuation. AE, remission and ineffectiveness were considered as main competitors, whereas all other reasons for discontinuation (e.g. lost to follow-up, patient’s decisions) were considered as right censoring (20). Subhazard ratios were estimated firstly in crude models, and then built by means of a backward selection multivariate model, using the same potential confounders as in prescription analysis, plus the PS. CIF were represented showing the probability of specific withdrawal over time.
**RESULTS**

A cohort of 2,881 patients with psoriasis treated with systemic therapy was analysed, of which 1,680 (58.3%) were male and 1,201 (41.7%) were female; of the latter, 56% were women of reproductive age (15–49 years). Median PASI at baseline was higher in men (11.2 vs 9, \( p < 0.0001 \)). Almost all patients had plaque psoriasis, although women had a higher frequency of guttate and palmoplantar pustular psoriasis (\( p < 0.0001 \)). Twelve percent of the patients had psoriatic arthritis, with no differences according to sex. Other demographic and baseline clinical patient characteristics are shown in Table I.

| Characteristics                        | Males (n = 1,680) | Females (n = 1,201) | Total (n = 2,881) | p-value |
|----------------------------------------|-------------------|---------------------|-------------------|---------|
| Age, years, median (IQR)              | 51.8 (42.1–61.6)  | 51.7 (40.8–62.8)    | 51.8 (41.6–62)    | 0.2021  |
| Disease duration, years, median (IQR) | 13.9 (6.3–23.6)   | 13.1 (5.3–25.5)     | 13.7 (5.8–24.3)   | 0.5399  |
| PASI, median (IQR)                    | 11.2 (7.2–16.2)   | 9 (5.1–13.5)        | 10.2 (6.2–15)     | < 0.0001|
| Current and former smoking, n (%)     | 712 (53)          | 451 (39)            | 1,163 (50)        | 0.0004  |
| Current and former alcohol consumption, n (%) | 455 (36) | 113 (12)            | 568 (26)         | < 0.0001|
| Body mass index, kg/m², n (%) < 18.5 | 3 (0)             | 21 (2)              | 24 (1)           | < 0.0001|
| 18.5–24.9                             | 354 (27)          | 365 (30)            | 719 (32)         |         |
| 25.29–29.9                            | 530 (41)          | 281 (30)            | 811 (36)         |         |
| ≥ 30                                   | 411 (32)          | 270 (29)            | 681 (30)         |         |
| Plaque psoriasis, n (%)               | 1,590 (95)        | 1,045 (87)          | 2,635 (91)       | < 0.0001|
| Guttate psoriasis, n (%)              | 57 (3)            | 85 (7)              | 142 (5)         | < 0.0001|
| Erythrodermic psoriasis, n (%)        | 38 (2)            | 16 (1)              | 54 (2)          | 0.0717  |
| Generalized pustular psoriasis, n (%) | 10 (1)            | 13 (1)              | 23 (1)          | 0.2016  |
| Palmoplantar pustular psoriasis, n (%)| 38 (2)            | 113 (9)             | 151 (5)         | < 0.0001|
| Anular pustular psoriasis, n (%)      | 4 (0)             | 3 (0)               | 7 (0)           | 1.0000  |
| Acrodermatitis continua of Hallopeau, n (%) | 2 (0)  | 1 (0)               | 3 (0)          | 1.0000  |
| Psoriatic arthritis, n (%)            | 200 (12)          | 140 (12)            | 340 (12)        | 0.8389  |
| Ischaemic heart disease, n (%)        | 60 (4)            | 17 (2)              | 77 (3)          | 0.0004  |
| Heart failure, n (%)                  | 17 (1)            | 12 (1)              | 29 (1)          | 0.9570  |
| Hypertension, n (%)                   | 354 (22)          | 240 (21)            | 594 (22)        | 0.5072  |
| Diabetes, n (%)                       | 189 (12)          | 119 (10)            | 308 (11)        | 0.2275  |
| Hypercholesterolaemia, n (%)          | 433 (27)          | 283 (25)            | 716 (26)        | 0.1739  |
| Chronic obstructive pulmonary disease, n (%) | 59 (4) | 20 (2)              | 79 (3)         | 0.0025  |
| Cancer in last 5 years excluding NMSC, n (%) | 6 (0)  | 5 (0)               | 11 (0)         | 1.0000  |
| Chronic liver disease, n (%)          | 116 (7)           | 37 (3)              | 153 (6)        | < 0.0001|
| Renal insufficiency, n (%)            | 24 (2)            | 13 (1)              | 37 (1)          | 0.4060  |
| Hepatitis B virus, n (%)              | 77 (6)            | 34 (4)              | 111 (5)        | 0.0090  |
| Hepatitis C virus, n (%)              | 43 (3)            | 16 (2)              | 59 (3)         | 0.0248  |
| HIV, n (%)                            | 16 (1)            | 2 (0)               | 18 (1)         | 0.0015  |

Variables with few missing data.
IQR: interquartile range; OR: odds ratio; PASI: Psoriasis Area and Severity Index; NMSC: non-melanoma skin cancer; HIV: human immunodeficiency virus. Shaded areas correspond to variables with a p-value < 0.05.
chronic obstructive pulmonary disease (COPD), liver failure), the clinical subtype of the disease (plaque psoriasis and psoriatic arthritis), PASI, number of previous classical systemic treatments, treatment order and previous phototherapy.

**Effectiveness**

No correlation was found between sex and risk of discontinuing the first treatment due to clinical ineffectiveness, neither crude nor corrected for significant confounders, such as the number of previous classical systemic drugs, specific treatment and propensity score (SHR 1.17; 95% CI 1.00–1.38; \( p = 0.055 \)). There were also no differences related to suspension due to remission of the disease, neither crude nor corrected for PASI, number of previous classical systemic drugs, liver failure, specific treatment and PS (SHR 1.00; 95% CI 0.83–1.20; \( p = 0.964 \)) (Table II).

Cumulative incidence curves in competing risks of ineffectiveness and remission over time are shown in Fig. 1. No statistical differences \( (p > 0.05) \) were observed between males and females.

**Safety**

Table III summarizes the differences in the rates of specific AE between males and females. The aIRR of AE was significantly higher in women, including both the overall rate (1.37, 95% CI 1.3–1.44) and the rate of SAE (1.28, 95% CI 1.09–1.51), leading to a risk difference (95% CI) of 232 (198–266) and 16 (5–26) events per 1,000 patient-years, respectively. However, the adjusted incidence rate of fatal AE was slightly lower in women, with a non-statistically significant effect (aIRR 0.55, 95% CI 0.3–1.01).

**DISCUSSION**

The main findings of this multicentre prospective study with a wide national cohort of psoriatic patients undergoing systemic treatment, are that: (i) women are more likely than men to be prescribed biologics; (ii) effectiveness seems to be similar in both groups; and (iii) AE are more common in women and associate with a different profile to that of men. Although researchers usually keep in mind the role that sex can play as a potential confounder, these findings highlight the fact that analysing results by sex itself is valuable.

Concerning psoriasis severity, men had more severe disease at baseline (median PASI 11.2 vs 9), as reported by other studies. Of note, only 12% of the patients in the current cohort had psoriatic arthritis (PsA), with no differences between men and women. Although wide-ranging prevalence estimates of PsA in patients with psoriasis have been reported in the literature, a recent meta-analysis found a prevalence of 22.7% among European patients (21). This difference could be due to real differences in prevalence between Spain and other countries. It could also be related to an information bias, due to lack of assessment of arthritis symptoms during

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**Table III. Prescription and effectiveness models of patients treated with modern systemic therapy, measuring the effect of sex**

| Prescription model | Crude OR, (95% CI) | \( p \)-value | Adjusted OR, (95% CI) | \( p \)-value |
|--------------------|--------------------|---------------|-----------------------|---------------|
| Females compared with males | 1.03 (0.93–1.15) | 0.5710 | 1.33 (1.15–1.55) \( a \) | 0.0001 |

| Effectiveness model | Crude SHR, (95% CI) | Adjusted SHR, (95% CI) |
|---------------------|---------------------|------------------------|
| Ineffectiveness: Females compared with males | 1.14 (0.97–1.33) | 0.1180 | 1.17 (1.00–1.38) \( b \) | 0.0550 |
| Remission: Females compared with males | 0.96 (0.81–1.14) | 0.6580 | 1.00 (0.83–1.20) \( c \) | 0.9640 |

\( a \) Corrected for age, risk habits (alcohol consumption and smoking), duration of disease, comorbidities (diabetes, COPD, liver failure), the clinical subtype of the disease (plaque psoriasis and psoriatic arthritis), PASI, number of previous classical systemic treatments, order of treatment and previous phototherapy. \( b \) Corrected for number of previous classical systemic drugs, specific treatment and propensity score. \( c \) Corrected for PASI, liver failure, number of previous classical systemic drugs, specific treatment and propensity score.

SHR: subhazard ratio; CI: confidence interval; OR: odds ratio. Shaded areas correspond to variables with a \( p \)-value < 0.05.

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**Fig. 1. Cumulative incidence curves of drug withdrawal, by sex.** Each line represents the cumulative probability of withdrawal for each specific reason over time.
Another possible reason is the exclusion of patients in the population into 2 groups: 20–40 years and > 40 years of age. The odds ratio (OR) of prescription was similar to that of the whole population, suggesting that age does not influence prescription in women.

Hägg et al. (5, 7) analysed the Swedish national registry of systemic treatments in psoriasis (PsorReg) to describe the time to prescription of a biologic. They found that 63% of patients treated with biologics were male. However, time to biologic prescription was similar in males and females when confounding factors were taken into consideration (age, BMI, presence of arthritis and PASI). More common prescription in males was attributed to men with more severe psoriasis. The current study included more relevant potential confounders, such as risk habits, comorbidities or previous classical systemic treatments, which could explain the different results. It is also possible that sex differences in prescription vary across countries.

Effectiveness was measured using drug survival as a proxy measure, as the current dataset and study design preclude better effectiveness outcomes from being used. Although this method has some drawbacks (14), the cur-

| Type of AE | Female (patient-years=3,894) | Male (patient-years=5,834) | Crude IRR, 95% CI | Adjusted IRR, 95% CI* |
|-----------|-----------------------------|---------------------------|-------------------|-----------------------|
| All AE    | Events, 3,056 | Incidence 785 (758–806) | 3,226 553 (534–3,226) | 1.4 (1.37–1.43) < 0.0001 | 1.37 (1.3–1.44) < 0.0001 |
| Serious AE | 280 72 (64–280) | 329 56 (51–329) | 1.27 (1.19–1.35) < 0.0001 | 1.28 (1.09–1.51) 0.0030 |
| Fatal AE  | 16 4 (3–16) | 33 6 (4–23) | 0.69 (0.54–0.88) 0.0027 | 0.55 (0.3–1.01) 0.0540 |
| Ear and labyrinth disorders | 32 8 (6–32) | 11 2 (1–11) | 4.25 (3.25–5.63) < 0.0001 | 4.09 (2.05–8.17) < 0.0001 |
| Endocrine disorders | 21 5 (4–21) | 9 2 (1–9) | 3.32 (2.4–4.58) < 0.0001 | 3.42 (2.56–7.48) 0.0020 |
| Skin and subcutaneous tissue disorders | 255 65 (58–255) | 213 37 (32–213) | 1.76 (1.63–1.9) < 0.0001 | 1.8 (1.49–2.17) < 0.0001 |
| Musculoskeletal and CTD | 259 67 (59–259) | 207 35 (31–207) | 1.88 (1.75–2.03) < 0.0001 | 1.77 (1.47–2.12) < 0.0001 |
| Neurologic disorders | 189 49 (42–189) | 139 24 (20–139) | 1.97 (1.8–2.15) < 0.0001 | 1.77 (1.42–2.21) < 0.0001 |
| Administration site conditions | 218 56 (49–218) | 174 30 (26–174) | 1.82 (1.68–1.98) < 0.0001 | 1.76 (1.44–2.16) < 0.0001 |
| Blood and lymphatic system disorders | 87 22 (18–87) | 72 12 (10–72) | 1.74 (1.53–1.97) < 0.0001 | 1.71 (1.25–2.34) 0.0010 |
| Gastrointestinal disorders | 261 72 (68–261) | 227 39 (34–227) | 1.76 (1.63–1.88) < 0.0001 | 1.55 (1.3–1.86) < 0.0001 |
| Malignant tumours | 91 23 (19–29) | 90 15 (13–19) | 1.5 (1.33–1.69) < 0.0001 | 1.55 (1.15–2.09) 0.0040 |
| Surgical and medical procedures | 140 36 (30–140) | 141 24 (20–141) | 1.49 (1.36–1.64) < 0.0001 | 1.46 (1.15–1.85) 0.0020 |
| Psychiatric disorders | 68 17 (14–68) | 67 11 (9–67) | 1.54 (1.34–1.77) < 0.0001 | 1.45 (1.03–2.05) 0.0350 |
| Infections and infestations | 553 142 (131–553) | 634 109 (101–634) | 1.32 (1.26–1.38) < 0.0001 | 1.28 (1.15–2.09) 0.0040 |
| Dermatologic disorders | 87 22 (18–87) | 72 12 (10–72) | 1.74 (1.53–1.97) < 0.0001 | 1.71 (1.25–2.34) 0.0010 |
| Endocrine disorders | 32 8 (6–32) | 31 5 (4–31) | 1.53 (1.25–1.87) < 0.0001 | 1.49 (0.9–2.46) 0.1230 |
| Injuries, poisoning and procedural complications | 99 25 (21–99) | 110 19 (16–110) | 1.35 (1.21–1.51) < 0.0001 | 1.26 (0.95–1.65) 0.1050 |
| Neoplasms benign, malignant and unspecified | 162 42 (36–162) | 205 35 (31–205) | 1.17 (1.08–1.28) < 0.0001 | 1.2 (0.97–1.48) 0.0000 |
| Respiratory disorders | 62 16 (12–62) | 79 14 (11–79) | 1.15 (1.1–1.32) 0.0461 | 1.05 (0.75–1.48) 0.7600 |
| Hepatobiliary disorders | 82 21 (17–92) | 126 22 (18–126) | 0.964 (0.86–1.08) 0.5234 | 1.075 (0.73–1.59) 0.5794 |
| Renal and urinary disorders | 41 11 (8–41) | 62 11 (8–62) | 0.99 (0.85–1.17) 0.9322 | 1.067 (1.15–2.07) 0.9870 |
| Metabolism and nutrition disorders | 206 53 (46–206) | 363 62 (56–363) | 0.82 (0.76–0.88) 0.0010 | 0.81 (0.68–0.96) 0.0100 |
| Social circumstances | 4 1 (0–3) | 7 1 (1–7) | 0.9 (0.54–1.47) 0.6622 | 0.64 (0.17–2.42) 0.5150 |
| Cardiac disorders | 31 8 (6–31) | 66 11 (9–66) | 0.69 (0.58–0.82) < 0.0001 | 0.62 (0.4–0.95) 0.0280 |
| Immune system disorders | 4 1 (0–4) | 6 1 (0–6) | 1.06 (0.64–1.78) 0.8131 | NA 1 (0–1) |
was a predictor for discontinuation of adalimumab, eta-

Similarly, Zweegers et al. (11) observed that female sex

cohort of patients with stable chronic plaque psoriasis.

sex itself was a risk factor for acute infective events in a

were less satisfied and experienced AE more frequently

also more frequent in women than men, suggesting that

to perceive a higher severity of the disease and demand

related to the fact that, as mentioned above, women tend

expect a greater risk of AE in the latter, in contrast to

women are treated with biological therapy more

enough than men, rather than classical drugs, and we would

find similar results in both groups.

Finally, a 37% higher rate of overall AE and 232 more

AEs per 1,000 person-years was found in females. Ad-

verse events were higher in women in all system groups

disease, except in investigations, metabolism, and

nutrition disorders and cardiac disorders. This is striking,

women have a greater risk of developing serious and

global AE. Despite the contrast in prescription and sa-

malian AE, these differences are relatively small and should not

prompt a different follow-up and management between

males and females. These results emphasize the need to

consider sex as a valuable factor in psoriasis systemic

therapy decision-making in routine practice care. They

also highlight the importance of analysing and presenting

results of studies by sex.

Conclusion

These findings indicate that there may be a sex distinction

in prescription of biological drugs in favour of females. Effectiveness, measured as drug survival, seems to be

similar in both sexes, either in terms of suspension due
to remission or ineffectiveness. We have found that women have a greater risk of developing serious and
global AE. Despite the contrast in prescription and safety, these differences are relatively small and should not
prompt a different follow-up and management between

males and females. These results emphasize the need to

consider sex as a valuable factor in psoriasis systemic

therapy decision-making in routine practice care. They

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Conflicts of interest. GC has been reimbursed by Janssen, Abbvie, Novartis, Pfizer, MSD and Celgene for advisory service and conference. RR acted as consultant and/or speaker for and/or participated in clinical trials as IP for Abbvie, Almirall, Celgene, Janssen, Leo Pharma, Lilly, Novartis, MSD and Pfizer-Wyeth. CF has served as a consultant and/or paid speaker for and/or participated in clinical trials sponsored by companies that manufacture drugs used for the treatment of psoriasis, including AbbVie, Amgen, Celgene, Janssen-Cilag, LEO Pharma, Lilly, Merck-Vienna, Pfizer, MSD and Dohme, Novartis Pfizer and Almirall. ED acted as consultant for Abbott, Amgen, Astellas, Centocor Ortho Biotech Inc, Galderma, Glaxo, Janssen-Cilag, Leo Pharma, Novartis, Pfizer, MSD and Celgene, received honoraria from Abbott, Amgen, Janssen-Cilag, Leo Pharma, Novartis, Pfizer, MSD, Celgene, participated in a speakers bureau for Abbott, Pfizer, MSD and Janssen and received grants from Pfizer, Abbott, Janssen and MSD. PdC acted as a consultant and/or speaker for Janssen-Cilag, AbbVie, MSD, Pfizer, Novartis, Lilly, Almirall, UCB, Biogen, Celgene, Amgen, Sandoz, Sanofi and Leo Pharma. IB acted as a consultant and/or speaker for and/or participated in clinical trials sponsored by companies that manufacture drugs used for the treatment of psoriasis, including Janssen Pharmaceuticals Inc, Almirall SA, Lilly, AbbVie, Novartis, Celgene, Biogen Amgen, Leo Pharma, Pfizer-Wyeth, and MSD. EH-A has served as consultant and/or speaker with Leo Pharma, Novartis, Janssen, Lilly, Celgene and Abbvie. DR-G has been reimbursed by Pfizer, Janssen, Celgene, Abbvie, Novartis and Leo Pharma for advisory services and conferences. MF has participated as speaker and/or advisor for Janssen, Lilly, Novartis, Pfizer, MSD, Abbvie Celgene and Almirall. MSeS has participated as speaker and/or consultant and/or speaker for AbbVie, Pfizer, Novartis, Lilly, Celgene, Leo Pharma, Pfizer and Almirall. JLS-C participated as AB from Janssen, Novartis and Leo Pharma. AS-T has served as a consultant and/or paid speaker for and/or participated in clinical trials sponsored by companies that manufacture drugs used for the treatment of psoriasis, including AbbVie, Celgene, Janssen-Cilag, LEO Pharma, Lilly, Novartis and Pfizer. LR acted as a consultant and speaker for Janssen-Cilag, AbbVie, MSD, Pfizer, Novartis, Lilly, Almirall, Celgene and Leo Pharma. JV-A participated as AB from Janssen, Novartis, AbbVie, Almirall and Celgene. CG-D participated as AB from AbbVie, Almirall and speaker for Janssen, Lilly and Celgene. JMC has participated as speaker and/or advisor for Celgene, Janssen, Lilly, Novartis, Leo Pharma, Pfizer, MSD, Abbvie, Biogen Amgen. ML-V acted as a consultant and speaker and participated in clinical trials for Janssen-Cilag, AbbVie, Celgene, Pfizer, Novartis, Lilly, Almirall and Leo Pharma. EH-C has served as a consultant and/or speaker for and/or participated in clinical trials as IP and sponsored by companies that manufacture drugs used for the treatment of psoriasis, including AbbVie, Janssen-Cilag, LEO Pharma, Lilly, Novartis and Pfizer. JLL-E participated as AB and received educational grants from Janssen, Abbvie, MSD, Lilly, Novartis, Leo Pharma, Pfizer. RB-E has served as a consultant and/or paid speaker for and/or participated in clinical trials sponsored by companies that manufacture drugs used for the treatment of psoriasis, including AbbVie, Celgene, Janssen-Cilag, LEO Pharma, Lilly, Novartis and Pfizer. JLL-E participated in clinical trials for Janssen-Cilag, AbbVie, Celgene, Pfizer, Novartis, Lilly, Almirall and Leo Pharma. EH-C has served as a consultant and/or speaker for and/or participated in clinical trials sponsored by companies that manufacture drugs used for the treatment of psoriasis, including AbbVie, Celgene, Janssen-Cilag, LEO Pharma, Lilly, Novartis and Pfizer. IG-D received travel grants for congresses from Abbvie, MSD and Pfizer.

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