THERAPEUTIC ADVANCES in
Gastroenterology

Original Research

PERFUSE: a French non-interventional study of patients with inflammatory bowel disease receiving infliximab biosimilar SB2: a 12-month analysis

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Ther Adv Gastroenterol

2023, Vol. 16: 1–14

DOI: 10.1177/17562848221145654

Abstract

Background: Flixabi™ (SB2) is a biosimilar of the reference infliximab (IFX), Remicade®. Published evidence on long-term, real-world use of SB2 in patients either IFX naive or transitioned from prior IFX is scarce.

Objectives: We evaluated persistence, effectiveness, and safety of SB2 over 12 months in adults with IBD [Crohn's disease (CD) and ulcerative colitis (UC)], participating in PERFUSE.

Design: PERFUSE is a long-term, non-interventional, multicenter study of patients receiving SB2 at specialist sites across France.

Methods: SB2 treatment was initiated in September 2017, either as first IFX treatment (IFX naive), after transition from treatment with reference IFX (IFX ref) or another IFX biosimilar (IFX bs), or both IFX ref and IFX bs (IFX multiswitch). Outcomes up to Month 12 (±2) include persistence on SB2 (primary outcome measure), SB2 dose, disease status, immunogenicity, and safety.

Results: This final 12-month analysis of patients with IBD includes 569 with CD and 168 with UC. Persistence [95% confidence interval (CI)] at Month 12 was CD: 89% (77.2; 94.9), UC: 78.5% (58.2; 89.8) for IFX naive; CD: 94% (91.0; 96.1), UC: 92.8% (84.8; 96.7) for IFX ref; CD: 91.6% (86.0; 95.0), UC: 94.2% (83.1; 98.1) for IFX bs; and CD 100% (100; 100), UC 100% (100; 100) for IFX multiswitch. In the CD and UC cohorts, disease activity among IFX naive patients declined from baseline to Month 12; with any prior IFX, the proportions of patients in remission at baseline, Month 6, and Month 12 remained unchanged in the UC cohort, and were comparable or higher in the CD cohort. No immunogenicity or safety signals were detected.

Conclusions: Patients with IBD can be initiated on SB2 or transitioned from IFX ref and/or IFX bs to SB2, with no loss of disease control or safety concerns, with >75% of naive and >90% of transitioned patients continuing on SB2 treatment at 12 months.

Keywords: biosimilar, infliximab, SB2, switch, transition

Received: 28 February 2022; revised manuscript accepted: 28 November 2022.

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Introduction

Flixabi™ (SB2), a biosimilar of the reference anti-tumor necrosis factor alpha antibody infliximab Remicade® (IFX ref),[1] is approved for use in all indications for which IFX ref is approved, including rheumatoid arthritis (RA), Crohn's disease (CD), ulcerative colitis (UC), ankylosing spondylitis, psoriatic arthritis, and psoriasis.[2] The marketing authorization for SB2 was granted based upon demonstration of comparable physicochemical and biological characteristics,[3] pharmacokinetic similarity in healthy subjects,[4] and

comparable efficacy and safety to IFX ref in patients with RA.[5]

Studies of treatment outcomes in populations outside pivotal clinical trials provide valuable insights that bridge medical knowledge between controlled environments and real-world practice. There is little published evidence on long-term, real-world use of SB2 in patients who are either IFX naive or have transitioned from prior IFX ref and/or another IFX biosimilar (IFX bs). Real-world data describing clinical outcomes in patients transitioning from reference biologics to corresponding biosimilars are important to inform the long-term effectiveness and safety of SB2 as treatment for patients with inflammatory bowel disease (IBD), both in treatment-naive individuals and in those transitioning from prior IFX therapy.

The PERFUSE study addresses the need for such real-world evidence. In this manuscript, we describe results from the analysis of the PERFUSE study adult IBD cohort followed to 12 months post-SB2 initiation.

Methods

Study design

PERFUSE (NCT03662919) is a long-term, non-interventional, multicenter study of patients receiving SB2 as routine therapy at specialist sites across France. Patients receiving SB2, prescribed at physician discretion independently of study inclusion, were enrolled between June 2018 and July 2019, to be followed for up to 24 months after initiation of SB2 treatment.

Patients who were 6 years or older, diagnosed with CD or UC, and who were either IFX naive or had received IFX ref and/or IFX bs prior to being initiated on SB2 from September 2017 were eligible for enrolment into PERFUSE. Patients not expected to be followed up at the same gastroenterology clinic for 2 years after SB2 initiation; patients with a primary diagnosis of psoriasis, rheumatoid juvenile rheumatoid arthritis, uveitis, or hidradenitis suppurativa; and women of childbearing potential intending to become pregnant during study follow-up were excluded. Results of the adult population are presented here.

There were no protocol-specified assessments or procedures; clinical data were captured retrospectively and/or prospectively from patient records. Study visits coincided with routine hospital visits. Patients received written and physician-communicated information about the study, and informed consent was documented.

The database extraction for this 12-month analysis was taken on 22 April 2021. Results are reported in line with the STROBE Statement (Strobe, 2022) (available in Supplemental Material).

Effectiveness and safety assessments

All data in PERFUSE were captured as part of routine clinical practice. As a non-interventional study, outcomes were measured according to the usual patient visit schedule, with flexibility around timeline milestones. For the analysis of disease scores, outcomes were reported for three time points: baseline (time of SB2 initiation) and Months 6 ($\pm$2) and 12 ($\pm$2) post-SB2 initiation. Patient characteristics at initiation of SB2 (age, gender, body mass index, disease history and status, previous biologic treatments, and relevant concomitant therapies prescribed at the time of enrolment) were documented. The primary outcome measure of the study was SB2 treatment persistence at Month 12. Outcomes related to treatment effectiveness, immunogenicity, and safety of SB2 at Month 12 were captured. Treatment effectiveness was assessed *via* the Harvey–Bradshaw Index (HBI)[6] and Simple Clinical Colitis Activity Index (SCCAI) disease scores[7] and disease status (high/low disease activity or remission) assigned accordingly. For patients with CD, disease activity is defined based on HBI score: remission ($<$5), low (5–7), moderate (8–16), or severe ($>$16). For patients with UC, disease category is defined based on SCCAI score, with a score of 5 or higher denoting active disease. Safety outcomes included serious and non-serious treatment-emergent adverse events (TEAEs). Investigators specified the reasons for SB2 discontinuation. Immunogenicity was determined based on detection of serum anti-drug (IFX) antibodies (ADAs) using the Lisa-Tracker ELISA kit (Theradiag, Croissy-Beaubourg, France),[8] which has been shown to correlate well with other infliximab monitoring assays.[9] Data on COVID-19 infection were incorporated into the study in the last quarter of 2020 to report the proportion of patients with a confirmed positive or negative COVID-19 test and to confirm the change or cessation of SB2 dosing due to the COVID-19 pandemic.

Sample size and statistical analysis

The 'all enrolled patients' population is defined as all eligible enrolled patients who received at least one infusion of SB2. Baseline is defined as the date of SB2 initiation. Kaplan–Meier (KM) techniques were used to analyze the primary outcome measure (i.e. the proportion of patients still treated with SB2 at Month 12). KM estimates of the quartiles (Q1, median, Q3) and corresponding 95% confidence interval (CI), as well as the range (minimum, maximum) are presented.

Disease scores were reported at baseline, Month 6 (±2), and Month 12 (±2); no imputation/replacement of missing values was performed. Continuous variables are reported as mean, standard deviation, minimum, 25th percentile (Q1), median, 75th percentile (Q3), maximum and 95% two-sided CIs, where appropriate. Categorical variables are summarized as frequencies and percentages. Proportions are presented with 95% two-sided CIs. The four patient subcohorts based on IFX exposure at baseline were (1) active substance-naive (IFX naive), (2) prior IFX ref, (3) prior IFX bs, and (4) prior IFX multiswitch (IFX ref + bs).

Results

Patient disposition, demographics, and baseline characteristics

The study enrolled 1233 adult patients (496 with rheumatology diagnoses and 737 with IBD diagnoses) at 12 gastroenterology and nine rheumatology sites. This final 12-month analysis of patients with IBD includes 569 with CD and 168 with UC. Clinical characteristics at baseline are presented in Table 1. At baseline, age and the proportion of female patients were comparable between the CD and UC cohorts. Mean duration of disease was shortest for IFX naive patients in both diagnostic groups. Any concomitant medications being taken by patients during the study period are detailed in Supplemental Table 1.

Persistence, SB2 dose, and reasons for discontinuation

Persistence (95% CI) on SB2 at Month 12 was CD: 89.0% (77.2; 94.9), UC: 78.5% (58.2; 89.8) in IFX naive patients; CD: 94.0% (91.0; 96.1), UC: 92.8% (84.8; 96.7) in IFX ref patients; CD: 91.6% (86.0; 95.0), UC: 94.2% (83.1; 98.1) in IFX bs patients; and 100.0% (100.0, 100.0) in both CD and UC IFX multiswitch patients. KM estimates (95% CI) of persistence on SB2 at Month 12 are shown in Figure 1.

In the CD cohort, 7 (13%) IFX-naive patients, 30 (8%) IFX ref patients, and 22 (14%) IFX bs patients discontinued SB2 prior to Month 12; corresponding numbers in the UC cohort were 8 (27%), 12 (14%), and 4 (7%) patients, respectively. Reasons for discontinuation are shown in Table 2.

SB2 dose levels were stable in all groups, with no clinically meaningful change from baseline to Month 12 in either cohort (Table 3; Figure 2).

Discontinuations occurred more frequently among IFX-naive patients in the UC patient cohort [$n = 8$ (27%)]; physician decision was the most common reason for discontinuation in all cohorts, based on loss of response. In the CD and UC cohorts, 6 (86%) and 7 (88%) IFX-naive patients, and 39 (75%) and 10 (63%) prior IFX patients, respectively, were prescribed a subsequent biologic treatment. Biologic therapies received by patients after SB2 discontinuation are detailed in Supplemental Table 2.

Disease status

Disease scores at baseline, Month 6, and Month 12 are shown in Table 4. In 13 patients with CD and seven with UC (all IFX naive), the mean change in disease score (HBI and SCCAI) from baseline to Month 12 was −4.9 (95% CI −7.7 to −2.1) and −7.1 (95% CI −9.6 to −4.7), respectively. In 205 and 90 patients with CD who transitioned from prior IFX ref ($n = 205$), or IFX bs ($n = 90$), or prior IFX multiswitch ($n = 39$), respectively, the mean change (95% CI) in disease score from baseline to Month 12 was −0.3 (−0.7 to 0.0), −0.1 (−0.6 to 0.3), and −0.5 (−1.1 to 0.1). In patients with UC who transitioned from prior IFX ref ($n = 47$) or prior IFX bs ($n = 34$), or prior IFX multiswitch ($n = 11$), mean change in disease score (95% CI) from baseline to Month 12 was −0.2 (−0.9 to 0.4), −0.0 (−0.7 to 0.6), and −0.1 (−1.0 to 0.8), respectively. Figure 3 shows the mean change in disease score in patients pre-treated with IFX ref or IFX bs from baseline to Month 6 and baseline to Month 12, in both the CD and UC cohorts.

Table 1. Clinical characteristics at baseline.

	n	CD cohort (*n* = 569)	*n*	UC cohort (*n* = 168)
Age, years, mean (SD)				
IFX naive	55	37.2 (15.8)	30	40.2 (13.7)
Prior IFX ref	358	38.7 (13.5)	84	42.3 (13.7)
Prior IFX bs	156	38.9 (12.9)	54	39.0 (13.7)
Prior IFX multiswitch	65	39.2 (12.6)	14	41.7 (16.2)
Women, *n* (%)				
IFX naive	55	26 (47.3)	30	10 (33.3)
Prior IFX ref	358	135 (37.7)	84	36 (42.9)
Prior IFX bs	156	74 (47.4)	54	30 (55.6)
Prior IFX multiswitch	65	32 (49.2)	14	9 (64.3)
Duration of disease, years, mean (SD)				
IFX naive	55	6.0 (7.6)	30	6.0 (7.2)
Prior IFX ref	358	14.9 (9.0)	84	11.4 (7.6)
Prior IFX bs	156	12.3 (9.4)	54	7.9 (7.6)
Prior IFX multiswitch	65	13.8 (8.7)	14	10.4 (7.3)

bs, biosimilar; CD, Crohn's disease; IFX, infliximab; multiswitch, both IFX ref and IFX bs; ref, reference; UC, ulcerative colitis.

Among patients who received prior IFX in the CD and UC cohorts, the proportion of patients in remission remained largely unchanged at baseline, Month 6, and Month 12 (Figure 4). In the IFX-naive patient population, disease activity was reduced from baseline to Month 12. The proportion in remission in the CD cohort was 33% at baseline and 88% at Month 12; in the UC cohort, the proportion in remission was 73% at baseline and 100% at Month 12.

Immunogenicity

In IFX-naive patients, two of the 55 patients in the CD cohort and two of the 30 patients in the UC cohort had an ADA test available prior to initiation of SB2; all were negative. In all, 30 patients from the CD cohort and 16 from the UC cohort had a post-baseline measurement, of whom six patients with CD and five patients with UC reported at least one positive result during the study.

In patients who received any prior IFX, of patients with an ADA test available prior to initiation of SB2, seven out of 54 patients in the CD cohort and two out of 18 patients in the UC cohort had a positive result. Post-baseline, 330 patients from the CD cohort and 92 patients from the UC cohort had at least one ADA measurement, of whom 32 patients with CD and nine patients with UC reported at least one positive result during the study (Table 5).

Safety

Non-serious, related TEAEs were reported in 7.3%, 16.5%, 15.4%, and 13.8% of patients in the CD cohort and in 10%, 9.5%, 13%, and 14.3% of patients in the UC cohort for the IFX naive, IFX ref, IFX bs, and IFX multiswitch groups, respectively.

In all, 86 serious TEAEs unrelated to IFX administration were reported for 77 patients; the

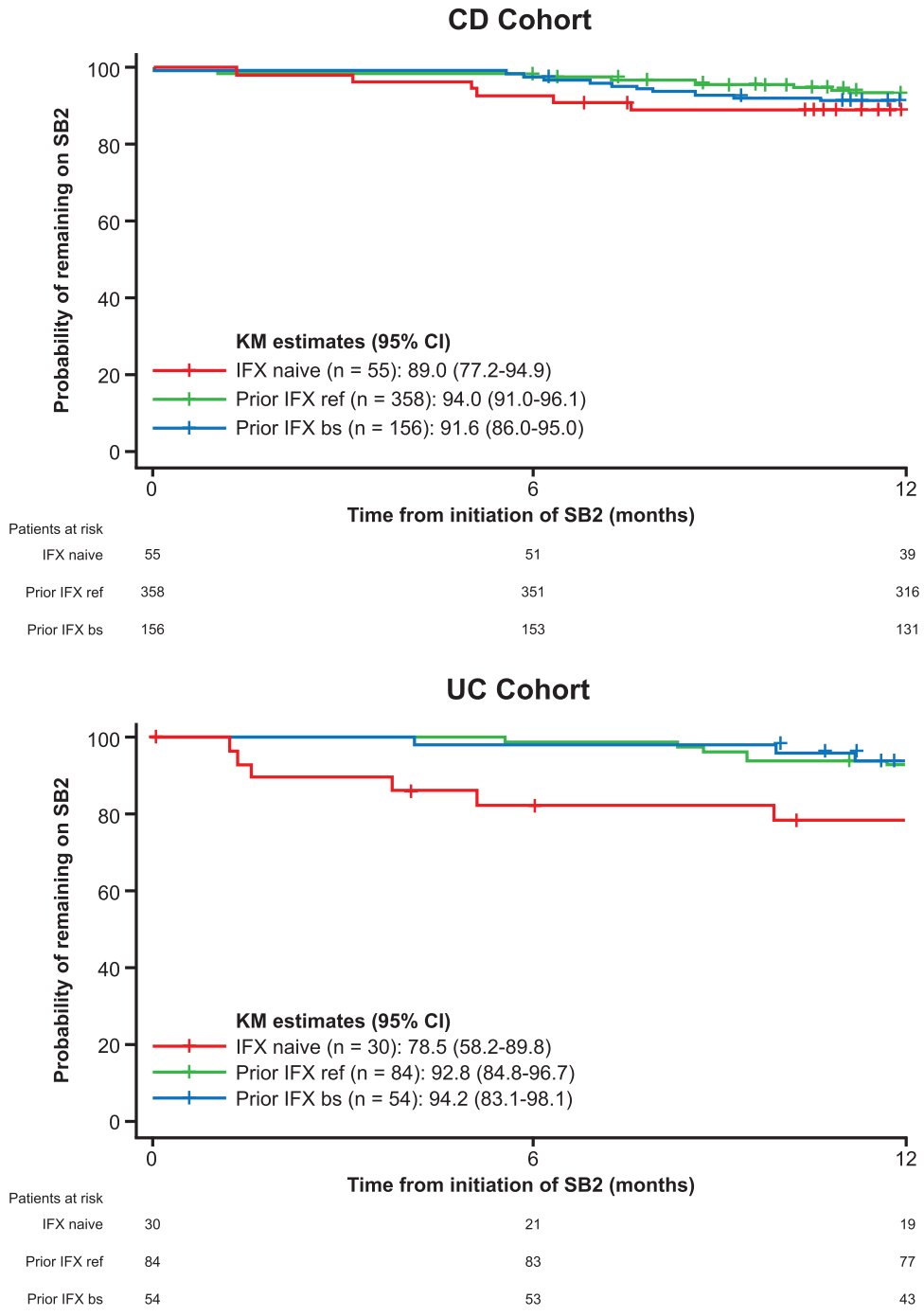

Figure 1. Persistence on SB2 over time.
bs, biosimilar; CD, Crohn's disease; IFX, infliximab; KM, Kaplan-Meier; ref, reference; UC, ulcerative colitis.

most common (>10) were gastrointestinal disorders ($n = 34$), infections and infestations ($n = 11$), and surgical and medical procedures ($n = 12$) (Supplemental Table 3).

Seven patients reported nine serious TEAEs considered to be related to IFX therapy: one patient experienced three events (cystitis, Vitamin B12 deficiency, and drug intolerance);

Table 2. Reasons for discontinuation of SB2[a].

n (%)	CD cohort (*n* = 569)				UC cohort (*n* = 168)			
	IFX naive (*n* = 55)	Prior IFX ref (*n* = 358)	Prior IFX bs (*n* = 156)	Prior IFX multiswitch (*n* = 65)	IFX naive (*n* = 30)	Prior IFX ref (*n* = 84)	Prior IFX bs (*n* = 54)	Prior IFX multiswitch (*n* = 14)
Patients who discontinued SB2	7 (12.7)	30 (8.4)	22 (14.1)	1 (1.5)	8 (26.7)	12 (14.3)	4 (7.4)	1 (7.1)
Reasons for discontinuation								
Adverse event	2 (3.6)	7 (2.0)	3 (1.9)	0 (0.0)	2 (6.7)	1 (1.2)	0 (0.0)	0 (0.0)
Physician decision, primary loss of response	2 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	2 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)
Physician decision, secondary loss of response	2 (3.6)	14 (3.9)	13 (8.3)	0 (0.0)	3 (10.0)	5 (6.0)	3 (5.6)	0 (0.0)
Patient decision	1 (1.8)	6 (1.7)	3 (1.9)	0 (0.0)	1 (3.3)	6 (7.1)	0 (0.0)	0 (0.0)
Physician decision, prolonged remission and other	0 (0)	3 (0.8)	3 (1.9)	1 (1.5)	0 (0.0)	0 (0.0)	1 (1.9)	1 (7.1)

[a]Not all discontinuations had a reason for discontinuation specified.
bs, biosimilar; CD, Crohn's disease; IFX, infliximab; multiswitch, both IFX ref and IFX bs; ref, reference; UC, ulcerative colitis.

Table 3. SB2 dose (mg/kg) at baseline, Month 6, and Month 12.

	CD cohort (*n* = 569)			UC cohort (*n* = 168)		
	n	Mean (SD)	Q1, Q3	*n*	Mean (SD)	Q1, Q3
Baseline						
IFX naive	55	5.4 (1.3)	5.0–5.0	30	5.8 (1.9)	5.0–5.0
Prior IFX ref	358	7.1 (2.4)	5.0–10.0	84	7.2 (2.5)	5.0–10.0
Prior IFX bs	156	7.2 (2.4)	5.0–10.0	54	7.5 (2.4)	5.0–10.0
Prior IFX multiswitch	65	7.5 (2.3)	5.0–10.0	14	7.0 (2.0)	5.0–7.5
Month 6						
IFX naive	55	6.5 (2.3)	5.0–10.0	24	7.3 (2.4)	5.0–10.0
Prior IFX ref	349	7.4 (2.5)	5.0–10.0	82	7.5 (2.5)	5.0–10.0
Prior IFX bs	154	7.5 (2.4)	5.0–10.0	54	7.4 (2.4)	5.0–10.0
Prior IFX multiswitch	65	7.7 (2.2)	5.0–10.0	14	6.8 (2.1)	5.0–7.5
Month 12						
IFX naive	47	6.3 (2.2)	5.0–9.0	19	7.1 (2.4)	5.0–10.0
Prior IFX ref	333	7.6 (2.5)	5.0–10.0	78	7.6 (2.5)	5.0–10.0
Prior IFX bs	143	7.7 (2.4)	5.0–10.0	51	7.6 (2.4)	5.0–10.0
Prior IFX multiswitch	65	7.8 (2.3)	5.0–10.0	14	7.1 (2.3)	5.0–10.0

bs, biosimilar; CD, Crohn's disease; IFX, infliximab; multiswitch, both IFX ref and IFX bs; Q, quartile; ref, reference; UC, ulcerative colitis.

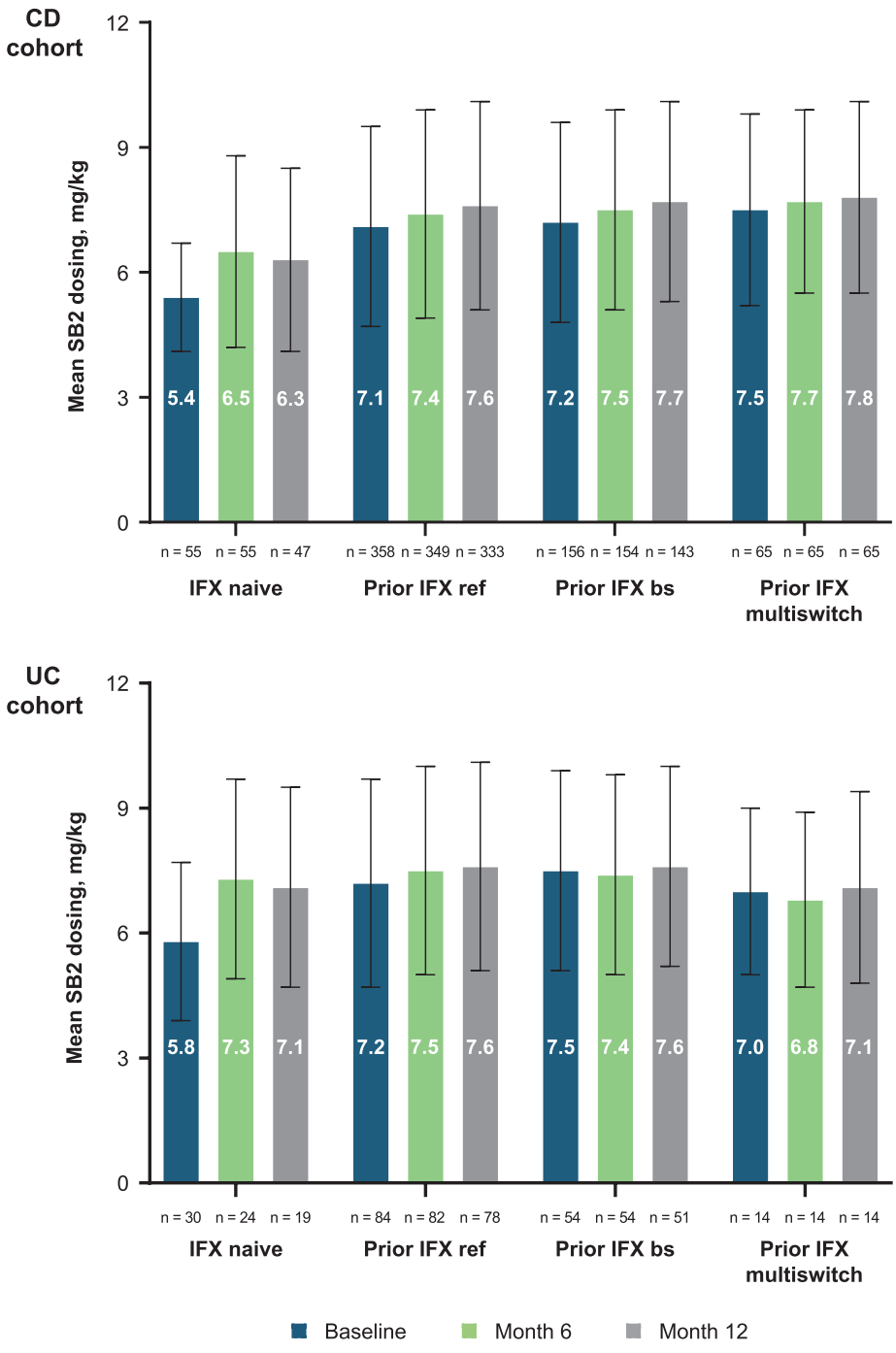

Figure 2. SB2 dose at baseline, Month 6, and Month 12.
bs, biosimilar; CD, Crohn's disease; IFX, infliximab; multiswitch, both IFX ref and IFX bs; ref, reference; UC, ulcerative colitis.

the remaining six events of hypersensitivity, *Clostridium difficile* infection, Campylobacter infection, intestinal obstruction, pustule, and anal stenosis were reported for a total of six patients (Table 6).

Discussion

This 12-month analysis indicates that patients with CD and UC can be successfully initiated on SB2 either as their first IFX therapy or when transitioning from IFX ref or IFX bs.

Table 4. Disease scores at baseline, Month 6, and Month 12.

Mean (95% CI)	*n*	CD cohort[a] (*n* = 569)	*n*	UC cohort[b] (*n* = 168)
Baseline				
IFX naive	21	7.0 (4.8; 9.2)	11	8.2 (6.3; 10.1)
Prior IFX ref	245	2.5 (4.8; 9.2)	62	1.4 (0.9; 1.9)
Prior IFX bs	111	2.5 (2.0; 3.0)	40	1.2 (0.7; 1.7)
Prior IFX multiswitch	43	1.8 (1.3; 2.3)	12	1.2 (0.2; 2.1)
Month 6				
IFX naive	34	3.2 (1.9; 4.4)	12	0.8 (–0.1; 1.7)
Prior IFX ref	268	2.0 (1.7; 2.3)	60	0.7 (0.4; 1.0)
Prior IFX bs	120	2.0 (1.6; 2.5)	37	1.3 (0.7; 1.8)
Prior IFX multiswitch	49	1.5 (0.9; 2.1)	12	1.2 (0.7; 2.1)
Month 12				
IFX naive	33	2.3 (1.3; 3.4)	13	0.9 (–0.1; 2.0)
Prior IFX ref	255	2.2 (1.9; 2.5)	51	1.1 (0.5; 1.6)
Prior IFX bs	107	2.1 (1.6; 2.5)	35	1.1 (0.6; 1.6)
Prior IFX multiswitch	48	1.1 (0.8; 1.4)	12	1.1 (0.5; 1.7)

[a]Measured using HBI.
[b]Measured using SCCAI.
bs, biosimilar; CD, Crohn's disease; HBI, Harvey–Bradshaw index; IFX, infliximab; multiswitch, both IFX ref and IFX bs; ref, reference; SCCAI, Simple Clinical Colitis Activity Index; UC, ulcerative colitis.

The persistence observed in the PERFUSE study at 12 months was high (>90%) in all transitioned cohorts, and, as such, not indicative of a 'nocebo effect'.[10] The nocebo effect is defined as a negative outcome of a pharmacological or non-pharmacological medical treatment that is induced by patients' expectations, and that is unrelated to the physiological action of the treatment.[11–13] Several studies investigating a switch to IFX bs have reported higher discontinuation rates in transitioned patients than in patients continuing treatment with IFX ref,[14] and it has been suggested that the reluctance of patients to switch may be influenced by a negative perception of biosimilars.[15] Moreover, it has been noted that differences in persistence with biosimilars were observed in open-label studies but not in blinded studies,[16] reinforcing the notion that knowledge of a switch to a biosimilar may affect patient perception and subsequent outcome. It has been suggested that the patient–healthcare provider relationship is a key driver of acceptance of biosimilars, and that prescriber and patient education may reduce the impact of nocebo effect.[17] To this end, participating centers in this study provided local patient education/information to mitigate the nocebo effect. This may underlie the high persistence observed in our study, regardless of the previous treatment prior to transitioning to SB2.

The findings in this study of patients with IBD in clinical practice suggest that initiation of SB2 in IFX naive individuals or in those who transitioned from IFX ref, IFX bs, or IFX multiswitch to SB2 is effective and safe; this is consistent with previous reports of clinical efficacy and safety of SB2 in patients with RA.[5,18,19] No clinically meaningful difference was observed in terms of clinical effectiveness during a 12-month period in patients with IBD who transitioned from IFX ref, IFX bs, or IFX multiswitch to SB2; notably, there was minimal change in disease activity during this period. No immunogenicity signal was observed.

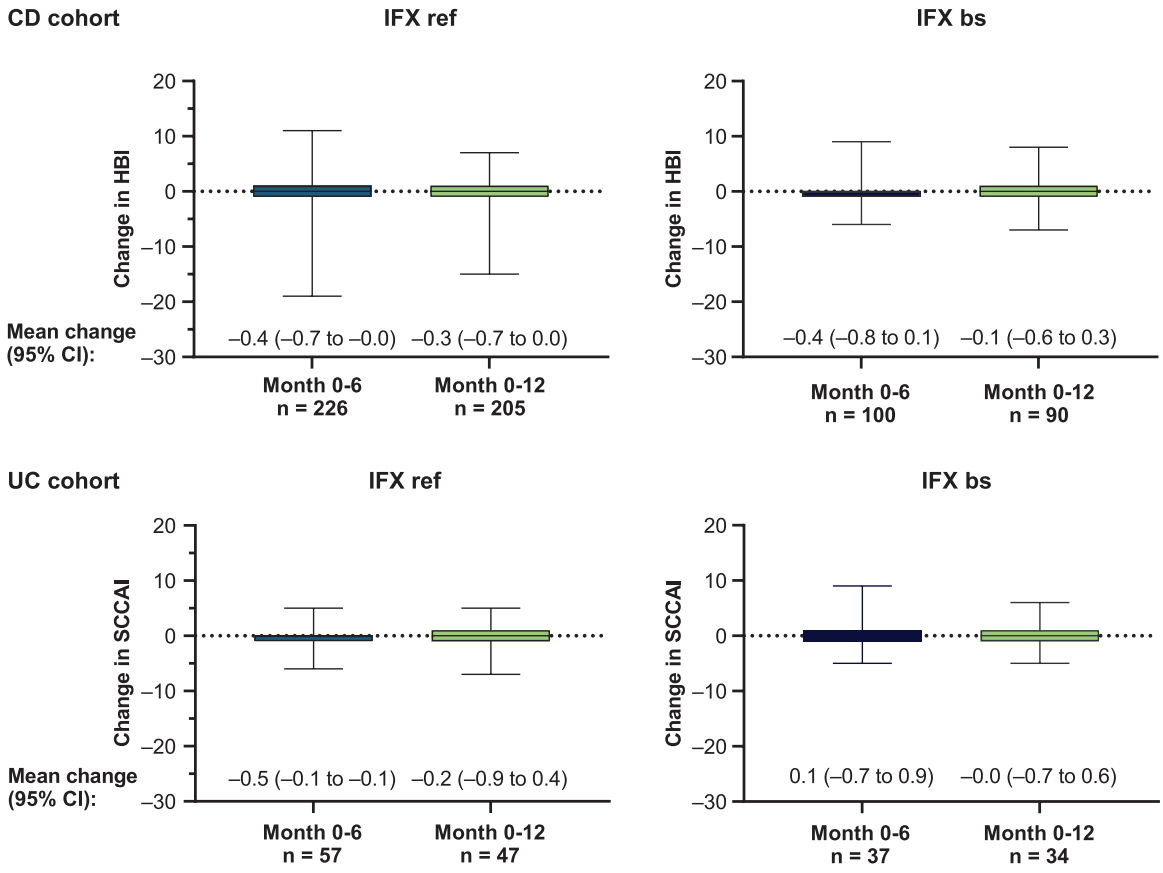

Figure 3. Change in disease score in patients transitioned from prior IFX ref and IFX bs.
bs, biosimilar; CD, Crohn's disease; HBI, Harvey–Bradshaw index; IFX, infliximab; ref, reference; SCCAI, Simple Clinical Colitis Activity Index; UC, ulcerative colitis.

The use of biologic treatments has transformed the management of chronic inflammatory diseases. However, although effective, these treatments may also be relatively expensive, leading to financial burden for healthcare systems and limiting access in certain countries. The introduction of biosimilar products in clinical practice has considerably reduced health expenditure, which has the potential to improve access to treatment.[20] Clinical and real-world studies such as PERFUSE provide evidence that patients receiving a reference compound can be effectively and safely transitioned to a biosimilar.

Few studies have been published on long-term SB2 treatment of patients with IBD. A prospective, non-interventional, observational study evaluated effectiveness, immunogenicity, and safety up to 80 weeks after a treatment switch from IFX ref to SB2 in 144 patients with IBD (94 CD, 50 UC) in routine clinical practice,[21] providing results that support those of the PERFUSE study. The study did not identify an immunogenicity concern, although immunogenicity testing was not routine in these patients. However, among those tested, the incidence of a positive ADA test was low. The prospective, observational SPOSIB SB2 study ($N = 276$) evaluated treatment with SB2 in patients with IBD (136 CD, 140 UC) in Italy, most of whom were naive to IFX treatment.[22] The authors concluded that a switch from ref IFX or CT-P13 to SB2 was safe and effective; these results are consistent with our findings.[22,23]

Another recent study evaluated the development of immunogenicity in 265 patients with chronic inflammatory diseases (RA, psoriatic arthritis, ankylosing spondylitis, and IBD) observed over 3 years.[24] These patients were receiving maintenance therapy with IFX ref and subsequently switched to an IFX bs (CT-P13), then to SB2; IFX-naive patients were initiated on CT-P13

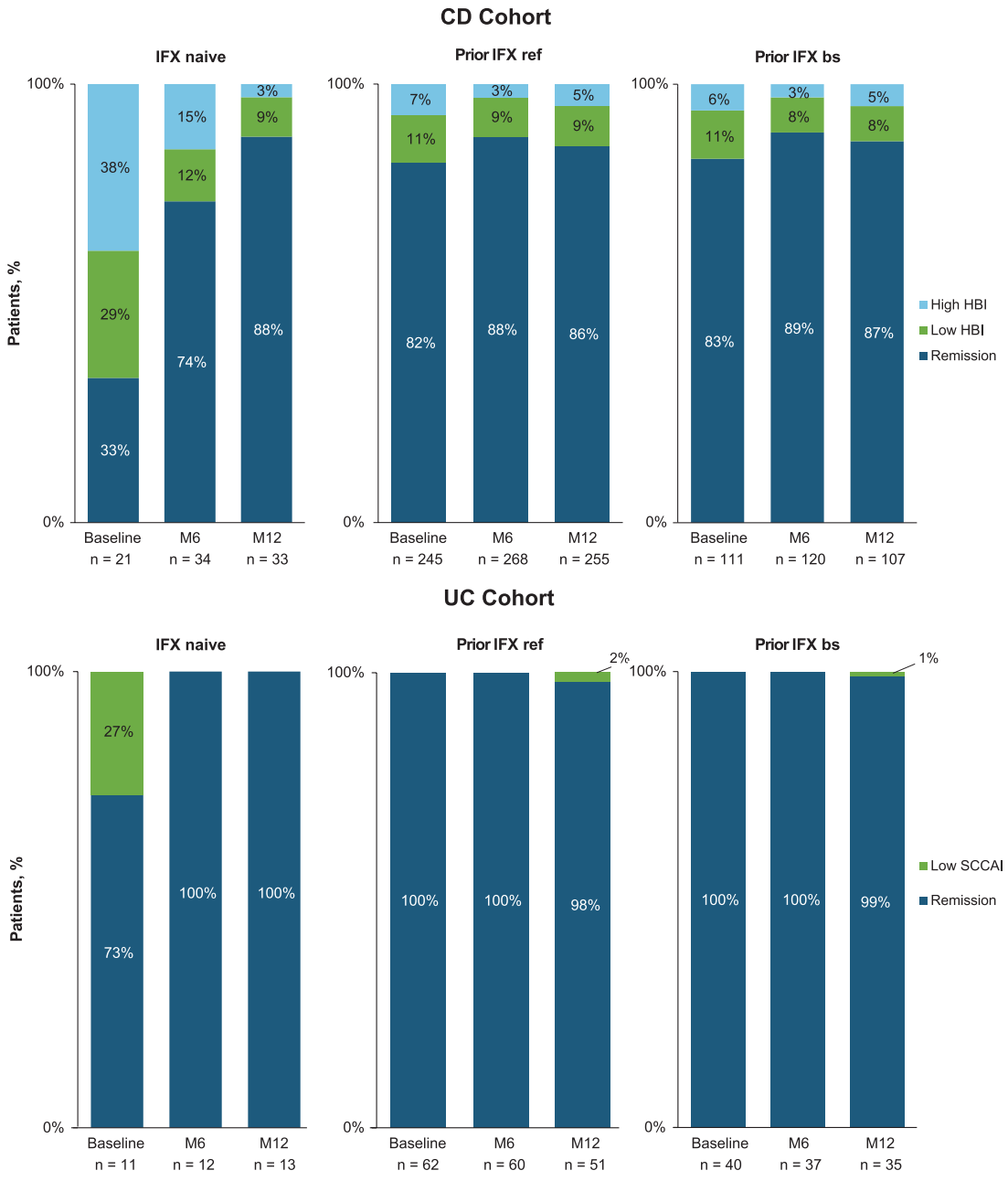

Figure 4. Disease category at baseline, Month 6, and Month 12. HBI high disease activity, ⩾8; low disease activity, 5–7; remission, <5. Low SCCAI, ⩽2; high SCCAI, >2.
bs, biosimilar; CD, Crohn's disease; HBI, Harvey–Bradshaw index; IFX, infliximab; ref, reference; SCCAI, Simple Clinical Colitis Activity Index; UC, ulcerative colitis.

then switched to SB2. The authors reported no increased immunogenicity post switch, corroborating our findings in PERFUSE (in a larger patient population).[25,26]

The PERFUSE study has several limitations related to its real-world setting. One is that ADA testing was not a routine procedure in all participating gastroenterology centers, which limits the generalizability of our findings regarding a lack of increased risk of immunogenicity following treatment transition to SB2. Another limitation is that there were no control groups of patients continuing IFX ref or other IFX bs, as all patients were transitioned to SB2.

Table 5. Immunogenicity: anti-drug (IFX) antibody status at baseline and post-baseline.

Patients, *n*	CD cohort			UC cohort		
	Baseline			Baseline		
	ADA positive at baseline	ADA negative at baseline	No history of ADA test at baseline	ADA positive at baseline	ADA negative at baseline	No history of ADA test at baseline
IFX-naive patients	*n* = 0	*n* = 2	*n* = 53	*n* = 0	*n* = 2	*n* = 28
ADA positive post-baseline[a]	0	0	6	0	0	5
ADA negative post-baseline[b]	0	2	22	0	1	10
No post-baseline ADA measurement	0	0	25	0	1	13
Patients previously treated with IFX[a]	*n* = 7	*n* = 47	*n* = 460	*n* = 2	*n* = 16	*n* = 120
ADA positive post-baseline[b]	2	1	29	0	0	9
ADA negative post-baseline[c]	3	31	264	1	9	73
No post-baseline ADA measurement	2	15	167	1	7	38

[a]IFX ref, or IFX bs, or IFX multiswitch.
[b]At least one positive result during the study.
[c]No positive result at any time during the study.
ADA, anti-drug (IFX) antibodies; CD, Crohn's disease; IFX, infliximab; UC, ulcerative colitis.

Table 6. Related serious adverse events.

	CD cohort (*n* = 569)			UC cohort (*n* = 168)		
	IFX naive *n* = 4	Prior IFX ref *n* = 3	Prior IFX bs *n* = 1	IFX naive *n* = 1	Prior IFX ref *n* = 0	Prior IFX bs *n* = 0
Gastrointestinal disorders						
Anal stenosis	–	1	–	–	–	–
Intestinal obstruction	–	1	–	–	–	–
General disorders and administration site conditions						
Drug intolerance	1	–	–	–	–	–
Metabolism and nutrition disorders						
Vitamin B12 deficiency	1	–	–	–	–	–
Immune system disorders						
Allergic reaction/hypersensitivity	1	–	–	1	–	–
Infections and infestations						
Campylobacter infection	–	1	–	–	–	–
Clostridium difficile	–	–	1	–	–	–
Cystitis	1	–	–	–	–	–

One IFX-naive patient with CD had multiple serious adverse events related to treatment. No serious adverse events were reported in the IFX multiswitch (prior IFX ref + bs) CD or UC cohorts.
bs, biosimilar; CD, Crohn's disease; IFX, infliximab; ref, reference; UC, ulcerative colitis.

Conclusion

This analysis of real-world data from the PERFUSE study indicates that patients with IBD can be successfully initiated on SB2 treatment or transitioned from prior IFX ref or IFX bs to SB2, with no loss of disease control and without safety concerns. The great majority of patients were continuing to receive SB2 at 12 months after the first dose. The follow-up of the PERFUSE study cohorts to 24 months post-initiation of SB2 is expected to provide pertinent information about long-term outcomes in these populations, helping to inform evidence-based treatment decisions.

Declarations

Ethics approval and consent to participate

The study was submitted to the Committee for the Protection of Persons (CPP) SUD-EST II and was approved on 21 March 2018 (ID-RCB). Patients received written and physician-communicated information about the study, and informed consent was documented.

Consent for publication

Not applicable.

Author contribution(s)

Yoram Bouhnik: Conceptualization; Investigation; Methodology; Validation; Writing – review & editing.

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Christine Martinez-Vinson: Data curation; Investigation; Validation; Writing – review & editing.

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Acknowledgements

We thank Sanoïa Digital CRO and the investigators, clinical research staff, and patients who participated in this study. Biogen provided funding for medical writing support in the development of this paper; Bess Reinoso, PhD (Excel Scientific Solutions, Fairfield, CT) produced the first draft of the manuscript based on input from authors, and Cara Farrell copyedited/styled the manuscript per journal requirements. Biogen reviewed and provided feedback on the paper to the authors. The authors had full editorial control of the paper and provided their final approval of all content.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was funded by Biogen Intl. GmbH.

Competing interests

YB reports consulting fees from AbbVie, Amgen, Biogaran, Biogen, Boehringer Ingelheim, Celltrion, Ferring, Fresenius Kabi, Galapagos, Gilead Sciences, Hospira, Janssen Pharmaceuticals, Eli Lilly, Mayoly Spindler Pharma, Merck, MSD, Norgine, Pfizer, Roche, Sandoz, Sanofi, Shire, Takeda and UCB; and grants from AbbVie, Ferring, Hospira, Janssen Pharmaceuticals, MSD and Takeda. BF received research grants from AbbVie, Lilly, MSD and Pfizer, and consultancy fees from AbbVie, Amgen, Biogen, BMS, Celltrion, Fresenius Kabi, Galapagos, Gilead, Janssen, Lilly, Medac, MSD, Mylan, NORDIC Pharma, Novartis, Pfizer, Roche, Sandoz, Sanofi-Genzyme, SOBI and UCB. LB received consulting fees from Janssen, Pfizer and Allergan; lecture fees from AbbVie, Janssen, Merck Sharp & Dohme, Ferring Pharmaceuticals, Mayoly-Spendler, Takeda and Tillots; and research support from Abbott, Ferring Pharmaceuticals, Hospira-Pfizer, Janssen, Merck Sharp & Dohme, Takeda and Tillots for unrelated studies. ALP declares no conflict of interest. CM-V received honoraria, speaker's fees, and/or congress fees from AbbVie, Adacolumn, MSD, Nestle and Biogen. UF, AB, and JA are employees and shareholders of Biogen.

Availability of data and materials

Associated data are included as online supplemental material.

Supplemental material

Supplemental material for this article is available online.

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