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INTRODUCTION
Overproduction of pro-inflammatory cytokines such as tumor necrosis factor alpha (TNF-α) is implicated in the pathobiology of a number of autoimmune conditions that affect various organ systems. First approved in Canada in September 2001, the monoclonal antibody infliximab (Remicade) is a TNF-α inhibitor indicated for the treatment of inflammatory bowel disease (IBD), psoriasis, and rheumatoid disease. By reducing circulating TNF-α levels, infliximab effectively reduces the signs and symptoms of these diseases, inducing and maintaining clinical remission, inhibiting the progression of structural damage, allowing mucosal healing, and/or improving physical functioning (Remicade 2013).

Biologic therapies such as infliximab are large protein molecules that require intravenous (IV) infusion or subcutaneous (SC) injection. Patient preferences for each of these modes of administration are mixed and seemingly dependent on many factors. Some studies suggest that SC injections may be preferable to IV infusions because of their perceived efficiency and convenience (Robinson 1993, Barton 2009, Pivot 2013, Barbee 2013, Vavricka 2012, Hirai 2014); however, others indicate that route of administration may be less important than a therapy’s known risk–benefit profile (Augustovski 2013, Fraenkel 2014). Drug selection may also be influenced by physician choice (Barton 2009). This finding is important, as two recent studies found discrepancies between physicians and biologic-naïve patients in terms of their preferences and openness toward these treatments (Goren 2015, Teeple 2015).

Additional considerations outside mode of administration may play a role in patients’ willingness to be treated with a particular biologic therapy. For example, the opportunity for interaction between patients and the immediate availability of a health care practitioner (e.g., doctor or nurse) have been cited as factors that increase preference for IV-infused therapies (Chilton 2008). In Canada, the vast majority (90%–95%) of patients receiving IV infusions of infliximab are managed through a

ABSTRACT
Purpose: To understand the perception of intravenous infusions in patients receiving infliximab (Remicade) within the BioAdvance patient support program (PSP).
Design: Intravenous infusion of infliximab occurs at approximately 200 clinics across Canada and is managed via the BioAdvance PSP. Patients were invited to complete a 28-question survey on demographics, disease/treatment characteristics, health rating, lifestyle, employment, and perception of intravenous infusions and the BioAdvance program.
Methodology: Analyses were exploratory and descriptive; collected data were self-reported ordinal (Likert scale, unfavorable-to-favorable, 1−10). The Wilcoxon signed-rank test was used to assess statistical significance, and multinomial logistic regression identified predictors of a positive perception of intravenous infusions.
Results: 1,712 patients completed the survey. Most respondents had been treated with infliximab for >2 years (58%), had not been previously treated with a biologic (74%), and were receiving treatment for inflammatory bowel disease (76%). Sixty-two percent of patients were employed and most traveled for personal/work reasons (57%) and had a busy/active lifestyle (76%) while attending the BioAdvance clinics. Before treatment, participants rated their perceived favorability of intravenous infusions at 5/10 (median; interquartile range, 5–7); after multiple infusions, their rating increased significantly to 8 (7–9) (P<.001). Regression analysis identified four predictors of a positive infusion experience: French language, favorable ratings of health, accuracy of physician’s description, and satisfaction with their BioAdvance coordinator. The vast majority of participants were likely to recommend the BioAdvance PSP.
Conclusion: The survey results indicate that the majority of patients receiving infliximab have a positive infusion experience within the BioAdvance PSP.
Keywords: infliximab; intravenous infusion; survey; patient support program
manufacturer-sponsored (Janssen Inc.) patient support program (PSP) known as BioAdvance (Janssen 2015). Available at approximately 200 clinics across Canada, this program provides personalized support and care for patients using infliximab for the treatment of chronic auto-immune conditions including Crohn’s disease, ulcerative colitis, psoriasis, rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis. Patients undergoing treatment within the BioAdvance PSP receive an unbroken chain of support on four core levels: drug administration, drug shipment, follow-up, and drug coverage. They are assigned a BioAdvance coordinator who provides one-on-one support in terms of initiating therapy, coordinating infusions, providing education, and aiding with reimbursement and financial assistance. Evidence suggests that PSPs such as BioAdvance have the potential to improve treatment effectiveness by playing an important role in increasing adherence to therapy (Ellrodt 1997, Badamgarav 2003, Kruis 2013).

Although some studies suggest improved outcomes with treatment administration via PSPs, overall, patients’ perceptions of the IV infusion and PSP experience remain unclear. The primary aim of the current study was to understand changes in patients’ perception of IV infusions while receiving treatment with infliximab within the BioAdvance PSP. Patients were also surveyed regarding various aspects of the PSP, such as initial concerns and overall satisfaction with their BioAdvance coordinator and the program.

**METHODS**

**Patient population and study design**

Between May 5 and July 18, 2014, approximately 10,000 brochures were distributed to patients undergoing treatment with infliximab at 192 clinics across Canada in the BioAdvance PSP. The brochures invited patients to participate in an online survey regarding their IV infusion and BioAdvance PSP experience. As an incentive, patients were entered into a drawing to win a tablet computer upon completion of the survey. All survey participants, or their legal guardian, provided informed written consent prior to enrollment. Both the survey and the BioAdvance PSP were funded by Janssen Inc.

The cross-sectional survey included 28 questions: 11 questions regarding patient demographics, disease and treatment characteristics, health rating, employment, and lifestyle; and 17 questions regarding perceptions of the IV experience within the BioAdvance PSP (see supplementary appendix for survey questions, online only at managedcaremag.com/bioadvance-survey). Similar to another recent BioAdvance survey (Kanters 2015), responses were provided in multiple choice format or rated on a Likert scale that ranged from 1 (lowest/very unfavorable rating) to 10 (highest/very favorable rating). Survey respondents were not followed over time but rather asked to recall perceptions before and/or after initiating therapy.

The primary objective of the survey was to understand patients’ overall perception of infliximab IV infusions before and after multiple treatments within the BioAdvance PSP. A subgroup analysis was performed to understand whether current perception of IV infusions varied by medical condition or by previous treatment with a biologic therapy. Key secondary objectives included the following: develop an understanding of patient demographics and lifestyles while on treatment; understand patient satisfaction with various components of the BioAdvance PSP; assess patients’ knowledge of and concerns before initiating therapy; and establish patients’ willingness to recommend the PSP to others. Predictors of a highly positive IV experience—conservatively defined as a Likert rating of 9/10 or 10/10—were explored using regression analyses.

**Statistical analyses**

All responses from patients receiving infliximab at the time of the survey were considered in the analysis, including those from incomplete surveys. Descriptive statistics, including proportions and median values (interquartile range [IQR]), were used to describe the responses. The Wilcoxon signed-rank test was used to assess statistically significant differences in perceptions recalled before and after initiating treatment. Kruskal–Wallis and Mann–Whitney U tests, with Bonferroni correction, were used in the subgroup analysis of the primary endpoint. Multinomial logistic regression analysis was conducted to identify predictors of a positive perception of IV infusions (i.e., a Likert scale rating of 6/10 to 10/10). Perception of IV infusions was divided into three categories based on Likert scale rating: 1/10 to 5/10; 6/10 to 8/10; and 9/10 and 10/10. Automated variable selection procedures (i.e., forward, backward, stepwise, lasso, least angular regression, and purposeful selection methods) were employed to investigate the most important explanatory variables that were candidates in the analysis (Bursac 2008). The variables potentially included age, language, gender, region of residence, employment status, length of infliximab treatment, previous history of biologic therapy, medical condition, health rating in the last month, travel, active lifestyle, ratings of satisfaction with their BioAdvance coordinator, importance of the presence of a health care practitioner at the infusion clinic, importance of spending time with patients, and accuracy of their physician’s description of the PSP. After these analyses, a final multi-
nominal logistic model was fit based on the most consistently identified predictors among analyses, with an emphasis on those with the highest rating of positive perception of IV infusions (Likert scale rating of 9/10 or 10/10). These associations were reported as odds ratios (ORs) and 95% confidence intervals (CIs). All analyses were conducted using SAS version 9.2 (SAS Institute, Cary, N.C.). The statistical methods of this study were reviewed by Chris Cameron, PhD, of Cornerstone Research Group and Brian Hutton, PhD, of the University of Ottawa, who also performs contracted work for Cornerstone Research Group.

RESULTS

Patient demographics

There were 1,712 responses to the 10,000 surveys distributed, for a response rate of 17%. When only questions that required an answer were considered, response rates ranged from 98.5% to 100%.

Table 1 presents the characteristics of the survey respondents. The median age was 41 years (IQR 30–53), and 872 (51%) participants were female. Sixty-two percent of patients reported that they were employed (full time, 51%; part time, 11%) while receiving infusions within the BioAdvance PSP. Eleven percent of patients were retired, 10% were students, 9% were on disability, and 8% were unemployed.

The majority of respondents were being treated for IBD (76%), had received only infliximab as biologic therapy (74%), and had been undergoing treatment within the BioAdvance PSP for more than two years (58%). The median rating for participant health status over the month prior to the survey was 8/10 (IQR 6–9) (Table 1). More than half (57%) of the participants were from Ontario (20%) or Quebec (37%).

### Primary outcome: Perception of IV experience before and after treatment initiation

The survey results indicated a marked improvement of IV perception after initiating infliximab infusions within the BioAdvance PSP. When recalling the time before initiating therapy, patients’ median rating of their perception of an IV infusion experience was 5 (IQR 5–7) (n=1,686); this rating increased statistically significantly to 8 (IQR 7–9; P<001) when patients considered their perception after receiving multiple infusions of infliximab (Figure 1). Analysis of this change showed that the majority of participants had either an improved (75%) or neutral (21%) perception after multiple infusions within the BioAdvance PSP. Moreover, participants who recalled a highly positive perception (rating of 9+) before treatment remained mainly positive (only 12% decreased their rating), and more than 95% of participants who recalled a very negative perception (rating of 1–3) improved their rating after initiation of treatment.

Subgroup analysis of the primary outcome indicated that the current perception of IV infusions was highly comparable among medical conditions (Table 2). Only the mean rating by respondents with Crohn’s disease was statistically significantly lower than those for respondents with ulcerative colitis, rheumatoid arthritis, and ankylosing spondylitis; however, after Bonferroni correction, none of these pairwise comparisons were statistically significant. Overall, the absolute difference in perception of IV infusion of infliximab was highly comparable among medical conditions (Table 2).

### TABLE 1

Self-reported patient demographics and characteristics (N=1,712)*

<table>
<thead>
<tr>
<th>Question/variable</th>
<th>Count (%) or median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>41 (30–53)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>872 (51%)</td>
</tr>
<tr>
<td>Male</td>
<td>837 (49%)</td>
</tr>
<tr>
<td>Primary language</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>1,223 (71%)</td>
</tr>
<tr>
<td>French</td>
<td>489 (29%)</td>
</tr>
<tr>
<td>Primary residence location</td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td>160 (9%)</td>
</tr>
<tr>
<td>Alberta</td>
<td>155 (9%)</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>68 (4%)</td>
</tr>
<tr>
<td>Manitoba</td>
<td>76 (4%)</td>
</tr>
<tr>
<td>Ontario</td>
<td>348 (20%)</td>
</tr>
<tr>
<td>Quebec</td>
<td>626 (37%)</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>103 (6%)</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>124 (7%)</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>15 (1%)</td>
</tr>
<tr>
<td>Newfoundland &amp; Labrador</td>
<td>35 (2%)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
</tr>
<tr>
<td>Employed full time</td>
<td>871 (51%)</td>
</tr>
<tr>
<td>Employed part time</td>
<td>181 (11%)</td>
</tr>
<tr>
<td>Student</td>
<td>164 (10%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>136 (8%)</td>
</tr>
<tr>
<td>Retired</td>
<td>193 (11%)</td>
</tr>
<tr>
<td>Disability</td>
<td>157 (9%)</td>
</tr>
<tr>
<td>Primary medical condition requiring IV infusion of infliximab</td>
<td></td>
</tr>
<tr>
<td>Crohn’s disease</td>
<td>927 (55%)</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>361 (21%)</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>129 (8%)</td>
</tr>
<tr>
<td>Ankylosing spondylitis</td>
<td>117 (7%)</td>
</tr>
<tr>
<td>Psoriatic arthritis</td>
<td>85 (5%)</td>
</tr>
<tr>
<td>Plaque psoriasis</td>
<td>70 (4%)</td>
</tr>
<tr>
<td>Length of treatment with infliximab</td>
<td></td>
</tr>
<tr>
<td>&lt;3 months</td>
<td>115 (7%)</td>
</tr>
<tr>
<td>3–6 months</td>
<td>141 (8%)</td>
</tr>
<tr>
<td>7–11 months</td>
<td>152 (9%)</td>
</tr>
<tr>
<td>1–2 years</td>
<td>302 (18%)</td>
</tr>
<tr>
<td>&gt;2 years</td>
<td>991 (58%)</td>
</tr>
<tr>
<td>Number of biologic therapies tried before infliximab</td>
<td></td>
</tr>
<tr>
<td>None (only infliximab)</td>
<td>1,257 (74%)</td>
</tr>
<tr>
<td>1</td>
<td>220 (13%)</td>
</tr>
<tr>
<td>2</td>
<td>93 (6%)</td>
</tr>
<tr>
<td>3</td>
<td>32 (2%)</td>
</tr>
<tr>
<td>&gt;3</td>
<td>40 (2%)</td>
</tr>
<tr>
<td>Not applicable</td>
<td>56 (3%)</td>
</tr>
<tr>
<td>Health rating over past month</td>
<td></td>
</tr>
<tr>
<td>(1=poor health; 10=perfect health)</td>
<td>8 (6–9)</td>
</tr>
</tbody>
</table>

*All responses were considered; some participants did not answer all questions.

IQR=interquartile range, IV=intravenous infusions.
Perception of a Patient Support Program for Infliximab

setting, and perceived loss of free time were concerns for approximately 30% of respondents. However, the majority of those attending the clinics stated that they were able to travel for work or personal reasons (57% overall; 65% of full-time employed participants) and categorized themselves as leading a busy and active lifestyle (76% overall; 88% of full-time employed participants) (Figure 2). Further, the majority of participants (76%) reported undertaking leisure activities during infusion therapy. Many spent their time meditating, napping, or relaxing (49%) or talking with other patients (43%). Twenty-two percent of participants reported doing work during treatment; this value increased to 26% in employed individuals (full time, 28%; part time, 18%).

While the participants rated the accuracy of their physician’s description of the BioAdvance PSP as favorable (median, 8; IQR 6–9) (Figure 3), some reported a residual need for certain types of information before initiating treatment. Most notably, some participants wished they had known about the atmosphere of the clinics (46%), that the infusions are performed by trained nurses (36%) and can fit into their schedules (29%), and that the clinics permit patient interaction and are social (29%).

Favorable Likert scale ratings were also provided for numerous other aspects of the BioAdvance PSP (Figure

<table>
<thead>
<tr>
<th>TABLE 2</th>
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<tbody>
<tr>
<td><strong>Perception of IV infusion experience by primary condition before and after initiating infliximab</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td>Overall</td>
</tr>
<tr>
<td>Crohn’s disease</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
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<tr>
<td>Rheumatoid arthritis</td>
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<tr>
<td>Ankylosing spondylitis</td>
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<tr>
<td>Psoriatic arthritis</td>
</tr>
<tr>
<td>Plaque psoriasis</td>
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</tbody>
</table>

IQR=interquartile range, IV=intravenous, SD=standard deviation

<table>
<thead>
<tr>
<th>TABLE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perception of IV experience with infliximab by history of biologic therapy</strong></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Overall</td>
</tr>
<tr>
<td>Biologic-naïve patients</td>
</tr>
<tr>
<td>Biologic-experienced patients</td>
</tr>
<tr>
<td>1 previous</td>
</tr>
<tr>
<td>2 previous</td>
</tr>
<tr>
<td>3 previous</td>
</tr>
<tr>
<td>&gt;3 previous</td>
</tr>
<tr>
<td>Not applicable</td>
</tr>
</tbody>
</table>

1Average change per patient.
IQR=interquartile range, IV=intravenous, SD=standard deviation

infusion was small between indications, ranging from 0.005 to 0.263. Respondents with psoriatic arthritis reported the greatest improvement in IV infusion perception. No difference was found in ratings between patients who had previously received biologic therapies, regardless of the number, compared with those who were naive to treatment (Table 3). Secondary outcomes: Perception of the BioAdvance PSP experience Many respondents indicated that they had specific concerns before initiating infliximab infusions within the BioAdvance PSP (Table 4). Most notably, pain, discomfort in a hospital-type setting, and perceived loss of free time were concerns for approximately 30% of respondents. However, the majority of those attending the clinics stated that they were able to travel for work or personal reasons (57% overall; 65% of full-time employed participants) and categorized themselves as leading a busy and active lifestyle (76% overall; 88% of full-time employed participants) (Figure 2). Further, the majority of participants (76%) reported undertaking leisure activities during infusion therapy. Many spent their time meditating, napping, or relaxing (49%) or talking with other patients (43%). Twenty-two percent of participants reported doing work during treatment; this value increased to 26% in employed individuals (full time, 28%; part time, 18%).

While the participants rated the accuracy of their physician’s description of the BioAdvance PSP as favorable (median, 8; IQR 6–9) (Figure 3), some reported a residual need for certain types of information before initiating treatment. Most notably, some participants wished they had known about the atmosphere of the clinics (46%), that the infusions are performed by trained nurses (36%) and can fit into their schedules (29%), and that the clinics permit patient interaction and are social (29%). Favorable Likert scale ratings were also provided for numerous other aspects of the BioAdvance PSP (Figure
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with a care coordinator and other patients, welcoming environment, other supportive services) appeared to increase patient satisfaction and may have reduced concerns regarding the IV infusion experience. This finding is likely applicable to the administration of other IV medications: Patients may benefit from the provision of similar supportive services in terms of adherence, compliance, and clinical outcomes.

The primary results of the survey showed that participants’ perception of IV infusions improved statistically significantly after undergoing multiple infusions of infliximab within the BioAdvance PSP. This improvement was most notable in participants who had an unfavorable perception before initiating treatment, as their ratings increased the most.

Importantly, this change could be clinically meaningful. An improved perception of IV infusions may have a positive impact on outcomes such as patient adherence to therapy, and adherence may improve health status and quality of life. In studies of pa-

### TABLE 4

<table>
<thead>
<tr>
<th>Concern</th>
<th>Proportion of patients* N=1712 n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV infusions would take away a lot of free time</td>
<td>511 (30)</td>
</tr>
<tr>
<td>IV infusions would be painful</td>
<td>505 (30)</td>
</tr>
<tr>
<td>Discomfort in a hospital-type setting</td>
<td>473 (28)</td>
</tr>
<tr>
<td>Clinic would be intimidating/boring</td>
<td>453 (27)</td>
</tr>
<tr>
<td>Clinic would be far away from home/work</td>
<td>400 (23)</td>
</tr>
<tr>
<td>Inability to find time to attend the clinic</td>
<td>335 (20)</td>
</tr>
<tr>
<td>Being alone during IV infusions</td>
<td>257 (15)</td>
</tr>
<tr>
<td>IV infusions would be done by someone inexperienced</td>
<td>219 (13)</td>
</tr>
</tbody>
</table>

*All responses were considered; a lack of response was counted as a lack of concern in this analysis. IV=intravenous
Perception of a Patient Support Program for Infliximab

Patients with Crohn's disease, patients who were adherent to infliximab had fewer emergency room visits and hospitalizations, a shorter length of hospital stay, and lower health care costs than those who were nonadherent to therapy (Carter 2011, 2012; Kane 2009). Similarly, in a recent survey of IBD patients treated with infliximab within the BioAdvance program, PSP participation was associated with improvements in self-perceived health ratings and productivity (e.g., fewer missed work days) (Kanters 2015). Patients who were more engaged in the program (e.g., through education services) and who had longer participation reported the greatest health benefits.

The secondary outcomes of the survey highlighted additional benefits of the BioAdvance PSP that may have contributed to the positive perception of the IV experience. Approximately a third of participants were concerned that infusions would have a negative impact on their free time; however, the majority indicated that they were able to travel and/or had a busy, active lifestyle, even while employed full time while attending the BioAdvance PSP. Similarly, many participants wished they had been told that the infusions could fit within their schedules. These findings suggest that the time required for IV infusions is perceived to have a minimal impact on patient leisure time, day-to-day activities, and productivity. Furthermore, despite reports in the literature of infusions being inconvenient for patients, it appears that the majority of survey participants did not feel this was the case. Published evidence suggests that improved convenience of care is associated with increased treatment adherence and potentially improved patient outcomes (Osterberg 2005, Haynes 2008).

Findings showed that concerns with initiating IV therapy were affected by the physician’s description

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**FIGURE 2**

Self-assessment of travel and lifestyle

<table>
<thead>
<tr>
<th></th>
<th>All responses were considered; some participants did not answer all questions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy, active lifestyle</td>
<td></td>
</tr>
<tr>
<td>Overall (N=1692)</td>
<td>76% No 88% Yes</td>
</tr>
<tr>
<td>Employed full time (n=868)</td>
<td>76% No 88% Yes</td>
</tr>
<tr>
<td>Employed part time (n=178)</td>
<td>76% No 88% Yes</td>
</tr>
<tr>
<td>Student (n=164)</td>
<td>80% No 66% Yes 61% No 31% Yes</td>
</tr>
<tr>
<td>Retired (n=191)</td>
<td>66% No 61% Yes 31% No 31% Yes</td>
</tr>
<tr>
<td>Unemployed (n=135)</td>
<td>61% No 31% Yes</td>
</tr>
<tr>
<td>Long-term disability (n=156)</td>
<td>31% No 31% Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you travel?</th>
<th>All responses were considered; some participants did not answer all questions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (N=1691)</td>
<td>57% No 65% Yes 56% No 46% Yes</td>
</tr>
<tr>
<td>Employed full time (n=870)</td>
<td>65% No 56% No 46% Yes</td>
</tr>
<tr>
<td>Employed part time (n=176)</td>
<td>56% No 46% Yes</td>
</tr>
<tr>
<td>Student (n=164)</td>
<td>46% No 55% Yes</td>
</tr>
<tr>
<td>Retired (n=188)</td>
<td>55% No 43% Yes</td>
</tr>
<tr>
<td>Unemployed (n=136)</td>
<td>43% No 38% Yes</td>
</tr>
<tr>
<td>Long-term disability (n=157)</td>
<td>38% No 38% Yes</td>
</tr>
</tbody>
</table>

**FIGURE 3**

Ratings of various aspects of the BioAdvance PSP

- Likelihood of recommending BioAdvance PSP to other patients
- Time commitment after multiple infusions
- Support of BioAdvance coordinator
- Importance of onsite health care practitioners
- Accuracy of physician’s description of the PSP
- Importance of spending time with other patients at clinic

Likert scale: 1 (Not favorable) to 10 (Extremely favorable)

IQR = interquartile range, PSP = patient support program

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of the process; therefore, there may be room for improvement in the provision of pre-treatment information to patients. Other studies have demonstrated that providing additional information before treatment influenced patient perception of IV therapy (Chilton 2008).

Additional analyses of components of the survey further indicated an overall positive experience within the manufacturer-sponsored BioAdvance PSP. Highly favorable ratings were provided for the support given by the program’s care coordinator and the importance of having a health care practitioner on site. Results from other studies suggest that the presence of a nurse or doctor may impact patient treatment decisions. In an evaluation of treatment preferences in patients with rheumatoid arthritis, having staff available if problems arose was an important consideration that influenced patient choice toward IV infusions (Hirai 2014).

Results from the multinomial regression analysis demonstrated an association between a highly positive perception of IV infusion and French language, favorable health rating at the time of the survey, satisfaction with the BioAdvance PSP care coordinators, and an accurate description of the PSP by physicians. Currently, an explanation for the association between positive IV perception and French language remains unclear, though it could relate to socioeconomic factors or specific activities within the Quebec-based clinics. In contrast, the association with favorable health rating is more expected, as patients who experience health benefits from treatment may be more likely to have a positive perception. While the median ratings for satisfaction with the BioAdvance coordinator and physician program description were high (both 9/10; IQR 8–9), efforts could still be made to improve these outcomes and potentially further improve patients’ perception of the IV infusion experience.

It was interesting to note that a history of biologic therapy was not associated with a positive IV perception, as one would expect patients who continue on therapy to have a favorable perception of treatment; however, these patients may have received therapy via another mode of administration. Further, it might be expected that working individuals would have a negative perception of IV infusions, as they may be inconvenienced by having to attend the infusion clinics. Our analysis did not show this to be the case, perhaps because of the classifications of employment used (e.g., students were pooled with full-time employed participants). Further analysis would be required to fully understand this relationship.

Perception of a Patient Support Program for Infliximab

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary language French</td>
<td>1.79 (1.09–2.93)</td>
</tr>
<tr>
<td>Health rating over previous month</td>
<td>3.31 (2.08–5.27)</td>
</tr>
<tr>
<td>Satisfaction with BioAdvance coordinator</td>
<td>2.77 (1.50–5.10)</td>
</tr>
<tr>
<td>Accuracy of physician’s description of the PSP</td>
<td>3.05 (1.92–4.83)</td>
</tr>
</tbody>
</table>

Multinomial regression analysis; median Likert scale rating for each predictor: 9/10–10/10.

CI=confidence interval, IV=intravenous, PSP=patient support program

Limitations
Several limitations are acknowledged in terms of the design and results of the study. The primary strength of the study is its inclusion of a large sample size, which enabled a relatively thorough evaluation of patient perceptions regarding their IV infusion and BioAdvance PSP experiences. However, recall and self-selection bias must be considered as limitations in survey-based studies. Furthermore, it is difficult to fully distinguish the impact of the various components of the BioAdvance PSP from that of actually receiving infliximab therapy (e.g., interaction with nurses, physicians; mode of administration); many factors may have contributed to the overall positive perception of the infusion experience. A longitudinal design that includes more specific questions at several points over the course of treatment would provide a clearer picture of the influence of these factors on patient perception over time.

Another limitation of this study was disproportionate number of respondents from Ontario (under-represented) and Quebec (over-represented) relative to shares of the total Canadian population. However, as the survey results were not analyzed by province, this was unlikely to have an impact on its findings.

Finally, the BioAdvance PSP is available only in Canada. Although there are many infusion clinics in the United States that provide IV infusion of infliximab and other therapies, it is unclear whether these findings apply to American facilities and patients.

CONCLUSION
In addition to efficacy and safety data, the drug administration preferences of patients often factor into prescribing decisions. While some studies have associated a relatively negative perception with biologic administration using IV infusions, the results of
the current survey suggest that patients have a positive experience with IV infusions of infliximab within the BioAdvance PSP. The personnel and services associated with the program appear to be helpful to and valued by patients. The services enhance the overall treatment experience and potentially improving adherence and long-term health outcomes. Further studies should be conducted to understand the specific PSP factors that affect patient perception of IV infusion and to assess whether PSPs have an impact on adherence and compliance to treatment.

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SUPPLEMENTARY APPENDIX
Patient survey
Questions included in the Remicade® BioAdvance® survey are presented below.

Demographic questions:
Please enter brochure reference number

Upon completion of this survey, you will be entered into a draw to win an iPad. In order to ship the iPad to the winner, we must collect your contact information. Please note, your personal identity will not be linked with any of your survey responses (refer to contest rules).

Name
Address
City, Province, Postal Code
Telephone Number

What is your age? Please enter exact age and not a range.

Please indicate your gender.
❑ Male
❑ Female

In what province or territory is your primary residence?
❑ British Columbia
❑ Alberta
❑ Saskatchewan
❑ Manitoba
❑ Ontario
❑ Quebec
❑ New Brunswick
❑ Nova Scotia
❑ Newfoundland & Labrador
❑ Prince Edward Island
❑ Yukon
❑ Northwest Territories
❑ Nunavut

Please provide your employment status.
❑ Employed full time
❑ Employed part time
❑ Student full time
❑ Retired
❑ Unemployed
❑ Long-term disability

Are you currently being treated with REMICADE®?
❑ Yes
❑ No

How long have you been treated with REMICADE®?
❑ 0 to 2 months
❑ 3 to 6 months
❑ 7 to 11 months
❑ 1 to 2 years
❑ Greater than 2 years

How many other biologic therapies have you tried before REMICADE®?
❑ None—REMICADE® is the first biologic therapy I am trying.
❑ 1 other biologic therapy
❑ 2 other biologic therapies
❑ 3 other biologic therapies
❑ More than 3 biologic therapies

Which of the following medical conditions is the primary reason you are receiving IV infusions of REMICADE®?
❑ Rheumatoid Arthritis
❑ Psoriatic Arthritis
❑ Ankylosing Spondylitis
❑ Crohn’s Disease
❑ Ulcerative Colitis
❑ Plaque Psoriasis

How would you rate your health over the past month (1=very poor health, 10=perfect health)?
❑ 1
❑ 2
❑ 3
❑ 4
❑ 5
❑ 6
❑ 7
❑ 8
❑ 9
❑ 10

Would you say that you travel for work or personal reasons?
❑ Yes
❑ No

Would you say that you have a busy, active lifestyle?
❑ Yes
❑ No

Survey Questions:
To the best of your knowledge, who funds the BioAdvance® clinics?
❑ Government
❑ Drug manufacturer
❑ Not-for-profit/patient groups
❑ Not sure

Within the first 6 months of your treatment at BioAdvance®, please rate the level of support you (and/or your caregiver) received from a BioAdvance® coordinator for the following:
1=no support, 10=excellent support:

Obtaining reimbursement for medication
1 2 3 4 5 6 7 8 9 10

Providing support related to your treatment (e.g., infusion process, education, emotional support, etc.)
1 2 3 4 5 6 7 8 9 10

Within the first 6 months enrolled at BioAdvance®, how much time did your BioAdvance® coordinator spend with you (and/or your caregiver) to do the following:

Obtaining reimbursement for medication
Number of phone calls
❑ 1–5
❑ 6–10
❑ 11–20
❑ 21–30
❑ 31–50
❑ 50+

Approximately how much time was spent for each conversation?
❑ 0–5 minutes
❑ 6–10 minutes
❑ 11–15 minutes
❑ 16–20 minutes
❑ 21–30 minutes
❑ 31–45 minutes
❑ 45+ minutes

Providing support related to your treatment (e.g., infusion process, education, emotional support etc.)
Number of phone calls
❑ 1–5
❑ 6–10
❑ 11–20
❑ 21–30
❑ 31–50
❑ 50+
### Perception of a Patient Support Program for Infliximab

**Approximately how much time was spent for each conversation?**
- 0–5 minutes
- 6–10 minutes
- 11–15 minutes
- 16–20 minutes
- 21–30 minutes
- 31–45 minutes
- 45+ minutes

**How would you rate your overall satisfaction with your BioAdvance® coordinator?**
- 1=not satisfied at all
- 10=extremely satisfied

**How important is it to you to have health care practitioners (doctors and nurses) on site at the BioAdvance® clinic?**
- 1=not important at all
- 10=extremely important

**Since beginning your treatment at the BioAdvance® clinics, has your time spent with other patients increased?**
- Yes
- No

**How do you spend your time while at a BioAdvance® clinic?**
- Working (job or school work)
- Talking to other patients
- Meditation, napping, or relaxation

**When your doctor first told you about being treated at a BioAdvance® clinic with an intravenous (IV) infusion, did you think that the time commitment would be worthwhile?**
- 1=not worthwhile
- 10=extremely worthwhile

**Now that you’ve had multiple IV infusions at a BioAdvance® clinic, is the overall time commitment worthwhile?**
- 1=not worthwhile
- 10=extremely worthwhile

**Would you recommend the BioAdvance® clinic to other patients?**
- 1=would never recommend
- 10=would recommend to everyone

**Before you started treatment at a BioAdvance® clinic, what did you think an IV infusion would be like?**
- 1=not favourable
- 10=extremely favourable

**Now that you have been receiving treatments at a BioAdvance® clinic, how do you find IV infusions to be like?**
- 1=not favourable
- 10=extremely favourable

**How accurately do you feel that your doctor described the BioAdvance® clinic experience, before you started your treatment?**
- 1=not accurately
- 10=very accurately

**Before you started treatment at the BioAdvance® clinic, what did you think an IV infusion would be like?**
- 1=not favourable
- 10=extremely favourable

**What did you wish you were told before coming to a BioAdvance® clinic to get your treatment?**
- IV fit into my schedule
- The clinic has a welcoming and comfortable atmosphere
- The clinic is not far from home/work
- The infusion is done by experienced nurses
- I sit near other patients getting infusions and it is social
- Online virtual tours and introductory clinic visits were available
- Other (free text)

**How would you make your experience at a BioAdvance® clinic better?**
- Improve scheduling for infusion times
- Hours—open on evenings and weekends
- Online appointment booking
- Improve the atmosphere of the clinic
- Provide other entertainment (e.g., tablet computers)
- Friendlier nurses/staff
- Facilitate social activities
- Other (free text)