Impact of the Adalimumab Patient Support Program's Care Coach Calls on Persistence and Adherence in Canada: An Observational Retrospective Cohort Study

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ABSTRACT

Purpose: Adalimumab (ADA) is a tumor necrosis factor-α inhibitor indicated for use in various immune-mediated inflammatory diseases. Patients receiving ADA in Canada are eligible to enroll in the AbbVie Care's Patient Support Program (PSP), which provides personalized services, including tailored interventions in the form of nurse-provided care coach calls (CCCs), with the goal of improving patients' experiences and outcomes. The primary objective of this study was to evaluate the impact of PSP services, including CCCs and patient characteristics, on persistence with and adherence to ADA for those patients enrolled in the PSP. A secondary objective was to estimate the effect of initial CCCs on treatment-initiation abandonment (ie, failure to initiate therapy after enrollment in the PSP).

Methods: An observational retrospective cohort study was conducted. A patient linkage algorithm based on probabilistic matching was developed to link the AbbVie Care PSP database to the QuintilesIMS longitudinal pharmacy transaction database. Patients who started ADA therapy between July 2010 and August 2014 were selected, and their prescriptions were evaluated for 12 months after the date of ADA start to calculate days until drug discontinuation, that is, the *end of persistence*, defined as >90 days without therapy. Cox proportional hazards modeling was used for estimating hazard ratios for the association between persistence and patient characteristics and each PSP service. Adherence, measured by medication possession ratio, was calculated, and multivariate logistic regression provided adjusted odds ratios for the relationship between being adherent (medication possession ratio ≥80%) and patient characteristics and each PSP service. Treatment-initiation abandonment among patients who received an initial CCC compared with those who did not was analyzed using the χ^2 test.

Findings: Analysis of 10,857 linked patients yielded statistically significant differences in the hazard ratio of discontinuation and the likelihood of being adherent across multiple variables between patients who received CCCs in comparison to patients who did not. Patients receiving CCCs were found to have a 72% decreased risk for therapy discontinuation (hazard

Accepted for publication February 2, 2018.
https://doi.org/10.1016/j.clinthera.2018.02.001
0149-2918/$ - see front matter

ratio = 0.282; $P < 0.0001$), and a greater likelihood of being adherent (odds ratio = 1.483; $P < 0.0001$), when compared with those patients who did not receive CCCs. The rate of treatment-initiation abandonment was significantly higher in patients who did not receive initial CCCs ($P < 0.0001$).

Implications: Ongoing CCCs, provided by AbbVie Care PSP, were associated with greater patient persistence and adherence over the first 12 months of treatment, while initial CCCs were associated with a lower rate of treatment-initiation abandonment. Results may inform the planning of interventions aimed at improving treatment adherence and patient outcomes. (*Clin Ther*. 2018;40:415–429)

Key words: adalimumab, immune-mediated inflammatory diseases, medication adherence, medication persistence, patient support program.

INTRODUCTION

Tumor necrosis factor-α is a proinflammatory cytokine that plays a crucial role in immune-mediated inflammatory diseases (IMIDs) such as rheumatoid arthritis (RA), psoriatic arthritis, psoriasis (PsO), Crohn disease (CD), ulcerative colitis (UC), ankylosing spondylitis, and hidradenitis suppurativa (HS). IMIDs lead to a significant decrease in quality of life secondary to severe functional impairment and pain.[1,2] The prevalence of IMIDs in Western society is estimated to be between 5% and 7%.[3] IMIDs have a significant impact on patients and their families; in addition, IMIDs lead to a significant burden to society due to high health care–related costs.[4]

The use of methotrexate, thiopurines, and corticosteroids to treat IMIDs has been associated with both toxicity and suboptimal disease control.[5,6] More recently, antagonists of tumor necrosis factor-α have proven to be highly effective for the treatment of a variety of rheumatologic, dermatologic, and gastroenterologic IMIDs, including RA, psoriatic arthritis, PsO, CD, UC, ankylosing spondylitis, and HS.

Persistence with and adherence to therapy are the cornerstones of treatment success in chronic diseases. Better adherence has been associated with shorter hospital lengths of stay, lower inpatient costs, and lower overall health costs in patients with CD.[7] Poor persistence and adherence can result in a treatment being less effective, which can increase the use of health care resources.[8,9]

Adalimumab (ADA*) is a subcutaneously administered antagonist of tumor necrosis factor-α. Its manufacturer offers a unique Patient Support Program (PSP; https://www.abbviecare.ca) for patients across all ADA-approved indications, including RA, psoriatic arthritis, PsO, CD, UC, ankylosing spondylitis, and HS. Components of the PSP include patient education, injection training, delivery and disposal of supplies, financial assistance, patient reminders, and direct contact with trained registered nurses known as *wellness case managers* who deliver ongoing tailored interventions in the form of care coach calls (CCCs). The receipt of CCCs, a service that was introduced in 2013, was dependent on being active in the PSP once the service was introduced, while the receipt of other services was dependent on patient needs. The PSP is intended to improve the overall patient experience with ADA treatment and to improve persistence and adherence, with better treatment outcomes.

A recent study assessed the impact of the US ADA PSP on health care costs and treatment adherence in the United States using administrative databases.[10] Enrollment in this PSP was associated with reduced medical costs (all-cause and disease-related) and total health care costs, and a 14% improvement of adherence over 1 year.[10] In addition, data from the multinational PASSION study (Impact of Participation in the Adalimumab [Humira] Patient Support Program on Rheumatoid Arthritis Treatment Course)[11] showed that better functional and clinical outcomes were achieved among PSP users with RA. To date, no studies have assessed the impact of PSPs for patients with IMID in Canada. Accordingly, COMPANION (Canadian Study of Outcomes in Adalimumab Patients With Support for Adherence) was conducted to evaluate the impact of the PSP.

The objectives of this study were 3-fold: (1) to describe the overall persistence and adherence with ADA for PSP patients, based on longitudinal prescription data; (2) to assess the impact of patient characteristics and the PSP CCC services on persistence with and adherence to ADA; and (3) to estimate the effect

*Trademark: Humira (AbbVie Inc, Chicago, Illinois).

of initial CCCs on *treatment-initiation abandonment*, defined as failure to initiate or start therapy after enrollment.

MATERIALS AND METHODS

Data Sources and Data Linkage

This study leveraged data from 2 distinct sources. The PSP database contains information on patient demographics, therapy profile, coverage profile, and patient interactions with the program and services received, but lacks comprehensive prescription data for patients not using the pharmacy services. The QuintilesIMS longitudinal pharmacy transaction database (LRx) captures anonymous prescription data collected from retail pharmacies across Canada. This is the largest pharmacy-level database available in Canada, includes ~75% of all retail prescriptions, and is recognized as a crucial national information source. It is an actively managed and quality-controlled database that captures patient demographic characteristics, drugs dispensed, dosage, quantity dispensed, number of days' supply, service date and place, cost, payer, and prescribing physician information.

A probabilistic matching[12,13] algorithm was developed to link the records of patients in the PSP database to those in the LRx, using all common data variables in both datasets, including patient sex, patient year of birth, prescribing physician, dispensing pharmacy, prescription fill date, and prescription cost. The linkage of records between the 2 datasets was carried out first by validation of data completeness, then by the linking of records through the creation of unique patient identifications. As a last step, the robustness of the patient linkage was evaluated by an assessment of the rate of false-positives. The positive predictive value of the algorithms ranged from 95.84% to 99.77%, indicating a low rate of false-positives. Review of this approach by G.L. and Muhammad Mamdani (Department of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Ontario, Canada) found that the linkage was successful, reliable, and suitable to address the research questions. The resultant linked dataset allowed for the study of the associations between services and interactions provided through the PSP and patient utilization of ADA in clinical practice.

All patients participating in the PSP signed a consent form authorizing the collection and pooling of patient information with third-party sources of information in an anonymous fashion. None of the patients analyzed had their identity or medical records disclosed for the purposes of this study, and only anonymized patient-level data were accessed by QuintilesIMS. Because no identifiable protected health information was extracted or accessed during the course of this study, no institutional review board review or approval was required.

Study Design and Study Population

An observational retrospective cohort study was undertaken. Bio-naïve patients who filled at least 1 prescription for ADA between July 1, 2010, and August 31, 2014, were identified. The date of the first prescription fill of ADA was defined as the *index date*. To ensure continuous eligibility throughout the study period, a 6-month preindex look-back period was used for ensuring that patients were naïve to ADA, a 12-month postindex analysis period was used in order

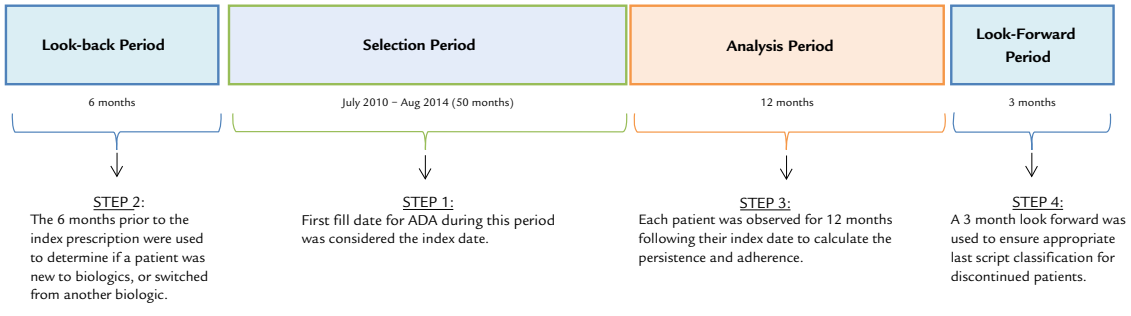

Figure 1. Study design.

to assess patient persistence with and adherence to ADA, and a 3-month look-forward period was used in order to evaluate patients' persistence on ADA and the status of each patient on their last day in the analysis period (Figure 1). An additional study eligibility criterion was enrollment in PSP after July 2010. Patients were excluded from the analysis if they had received ADA for <30 days (in order to standardize adherence and persistence calculations across indications that may involve a loading phase), or if their index ADA date was >90 days prior to enrollment in the PSP. Patients with index ADA data >90 days prior to enrollment were excluded as a form of quality control. The study was designed to assess patients who were enrolled in the PSP at the time of treatment initiation. As such, a total of 257 patients were removed, representing 1.8% of linked patients.

When evaluating *nonstart patients,* defined as those patients who did not initiate treatment with ADA after receiving a prescription, and the rate of treatment-initiation abandonment, all patients who enrolled in the PSP between 2013 and 2015 were considered without the need for any linkage to the LRx database. Nonstart patients were captured and confirmed within the PSP as part of standard operating procedures of the program, while the time period was selected to align on the introduction of the pre-ADA CCCs.

Study Outcomes

The primary outcome of interest was 12-month persistence with and adherence to ADA. *Medication persistence* refers to the act of continuing the treatment for the prescribed duration. Cramer et al defined *persistence* as "the duration of time from initiation to discontinuation of therapy, Page 44."[14] *Persistence* with ADA therapy in the present study was defined as the duration of continuous treatment, with no gap exceeding 90 days. Specifically, persistence with ADA was calculated as the interval from the index date to the *end of therapy,* defined as over 90 days without prescription data, and was censored at 365 days for patients still on therapy at the end of the study period. *Medication adherence* refers to the degree or extent of conformity to the recommendations about day-to-day treatment by the provider with respect to the timing, dose, and frequency. Cramer et al defined *adherence* as "the extent to which a patient acts in accordance with the prescribed interval, and dose of a dosing regimen, Page 44."[14] Adherence to ADA therapy in the present study was measured by an evaluation of patients' medication possession ratio (MPR) during their period persistent on therapy.[15] Patients with ≥80% MPR were classified as being adherent. MPR was calculated for each patient by evaluation of the sum of unique days of medication supplied across all but the last pharmacy transaction within the 12-month study period, divided by the total number of days between the dates of the first and last ADA-related pharmacy transactions.[16,17] MPR was calculated only for patients with at least 2 ADA prescriptions after the index date and was censored at 100%. As the sum of days supplied was used without any adjustment for overlap, it is possible that in some cases the sum could have been greater than the total number of days between the first and last prescriptions, which may have resulted in an MPR >100%.

A secondary outcome of interest was the rate of *treatment-initiation abandonment,* defined as failure to initiate therapy after enrollment in the PSP. This analysis included all PSP patients who were enrolled between 2013 and 2015. The time period for evaluating the rate of treatment-initiation abandonment was aligned with the introduction of initial CCCs in July 2013. The analysis period for this outcome extended to September 2015.

Statistical Analysis

Descriptive statistics (mean [SD]) were used for summarizing patients' baseline demographic and disease characteristics. Baseline demographics, clinical characteristics, and rates of treatment-initiation abandonment were further analyzed by the χ^2 test for comparison of groups for categorical variables. Cox regression analysis was conducted to determine hazard ratios (HRs) for the association between persistence and covariates, including patient characteristics and PSP services, including CCCs. Multivariate logistic regression analysis was conducted to estimate odds ratios (ORs) for the relationship between being adherent (MPR ≥80%) and covariates, including patient characteristics and PSP services, including CCCs. Other recently published studies evaluating similar outcomes have used these types of analytical methods as well.[16,18–21] Adjustment for multiple potential confounders was performed in all regression analyses. In total, 26 individual variables

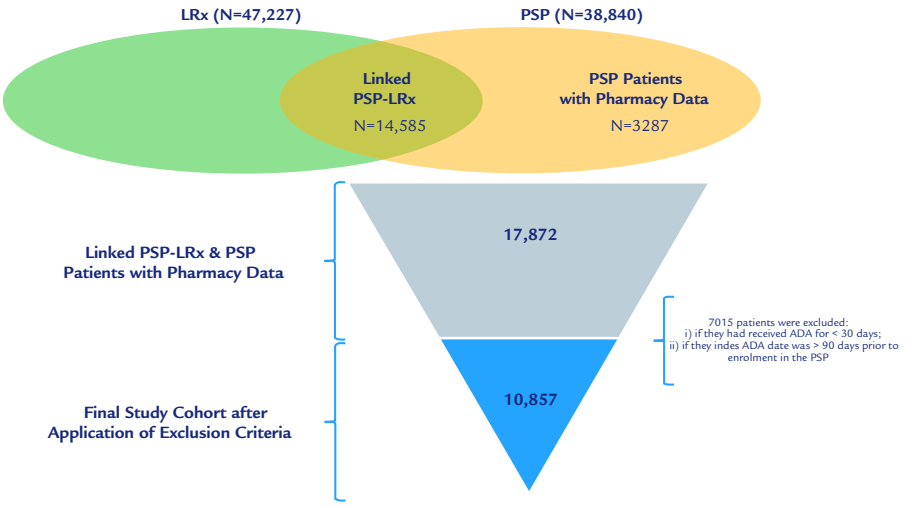

Figure 2. Patient selection.

were included in the multivariate modeling, covering patient demographics, insurance coverage, medication use, and PSP services. Reference levels were selected based on either clinical judgment or the number of observations in the groups. If 1 level within the variables had substantially more observations than did other levels in the variable, the level with the largest number of observations was selected as the reference level to reduce SE and decrease the CI width of the coefficients for the other levels. *P* values <0.05 were considered statistically significant. Data extraction and statistical analyses were conducted using SAS version 9.2 (SAS Institute Inc, Cary, NC).

RESULTS

Patient Population Characteristics

Patient records for 47,227 and 38,840 individuals were extracted from the LRx and PSP databases, respectively. The probabilistic linkage algorithm yielded a total sample of 14,585 LRx patients with index dates between July 1, 2010, and August 31, 2014. An additional 3287 patients were added for whom pharmacy transactional data were not included in LRx, but were made available by the dispensing pharmacy. From this combined dataset, a total of 7015 patients were excluded based on predefined exclusion criteria (Figure 2), leaving 10,857 in the final study cohort (Figure 2).

Baseline demographic and clinical characteristics of the study population are shown in Table I. PSP patients who were linked to LRx had age, sex, treatment, and payer type similar to those in the overall PSP population (Table I). Most patients (55%) were female, most belonged to private drug plans (59%), and most were from Ontario (40%) and Quebec (27%). British Columbia was not well represented, as privacy regulations prevented the release of data required by the matching algorithm. Patients affected by CD comprised 39% of the study cohort; 23% had spondyloarthropathies (SpAs), 19% had RA, 14% had PsO, 3% had UC, and <1% had HS. No diagnosis was available for 1% of patients.

Overall Persistence With and Adherence to Adalimumab Therapy

The PSP-linked cohort had a mean (SD) persistence of 296 (113) days over the 12-month observation period, and 65% of patients remained persistent after 365 days. Patients had a mean persistence of 286 (118), 305 (107), and 295 (111) days when treated for rheumatologic, gastroenterologic, and dermatologic

Table I. Baseline demographics of study cohort.

Characteristic	All PSP (N = 38,840)	Indexed (n = 10,857)
Year at index		
July 2010	–	1788 (16.5)
July 2011	–	2440 (22.5)
July 2012	–	2974 (27.4)
July 2013	–	3655 (33.7)
Sex		
Female	21,145 (54.4)	5988 (55.2)
Male	17,299 (44.5)	4858 (44.7)
Age group		
0–17 y	1231 (3.2)	148 (1.4)
18–29 y	5645 (14.5)	1130 (10.4)
30–39 y	7223 (18.6)	1882 (17.3)
40–49 y	8060 (20.8)	2248 (20.7)
50–59 y	8904 (22.9)	2584 (23.8)
60–69 y	5551 (14.3)	1871 (17.2)
70+ y	2226 (5.7)	994 (9.2)
Marital status		
Single	9689 (24.9)	2602 (24.0)
Married	21,665 (55.8)	6140 (56.6)
Separated/ divorced/ widowed	3658 (9.4)	1020 (9.4)
Unknown	3828 (9.9)	1095 (10.1)
Diagnosis		
CD	13,940 (35.9)	4230 (39.0)
HS	302 (0.8)	42 (0.4)
UC	1794 (4.6)	347 (3.2)
PsO	5060 (13.0)	1513 (13.9)
RA	7686 (19.8)	2067 (19.0)
SpA	9413 (24.2)	2499 (23.0)
Other	645 (1.7)	159 (1.5)
Province		
British Columbia	4397 (11.3)	22 (0.2)
Alberta	3609 (9.3)	1527 (14.1)
Saskatchewan	801 (2.1)	273 (2.5)
Manitoba	1049 (2.7)	84 (0.8)
Ontario	11914 (30.7)	4313 (39.7)
Quebec	9389 (24.2)	2889 (26.6
New Brunswick	1202 (3.1)	598 (5.5)
Prince Edward Island	166 (0.4)	51 (0.5)
Nova Scotia	1454 (3.7)	724 (6.7)
Newfoundland and Labrador	1049 (2.7)	376 (3.5)
Unknown	3749 (9.7)	0
Payer coverage*		
Public	12,095 (31.1)	2669 (24.6)
Private	14,438 (37.2)	6493 (59.8)
Both	11,628 (29.9)	1169 (10.8)
Undefined/none	679 (1.7)	526 (4.8)
Initial CCC		
Yes	15,749 (40.5)	2956 (27.2)
No	23,091 (59.5)	7901 (72.8)
Ongoing CCC		
Yes	24,081 (62.0)	3740 (34.4)
No	14,759 (38.0)	7117 (65.6)

CD = Crohn disease; HS = hidradenitis suppurativa; PsO = psoriasis; RA = rheumatoid arthritis; SpA = spondyloarthropathies; UC = ulcerative colitis.

*Payer coverage: for Patient Support Program (PSP), nonlinked and linked patients is based on PSP data while for Indexed patients is based on the payer information captured in QuintilesIMS longitudinal pharmacy transaction database and pharmacy data.

conditions, respectively. Comparison of 12-month persistence rates between patients who received CCCs and those who did not receive CCCs across all indications (77.9% vs 59.5%; $P < 0.001$), and within the rheumatology (76.0% vs 55.6%; $P < 0.001$), gastroenterology (80.3% vs 64.5%; $P < 0.001$), and dermatology (76.1% vs 57.7%; $P < 0.001$) cohorts are shown in Figure 3.

During the study period, 42.8% of patients had an MPR ≥80% (Table II). Comparison of adherence rates (MPR ≥80%) between patients who received CCCs and those who did not receive CCCs, across all indications (45.6% vs 41.3%; $P < 0.001$), and within the rheumatology (42.8% vs 37.9%; $P < 0.01$), gastroenterology (48.3% vs 45.4%; $P = 0.08$), and dermatology (45.2% vs 39.7%; $P < 0.05$) cohorts, is demonstrated in Table II.

The mean (SD) MPR for all patients was 69.4% (20.9%) over the persistence period. Patients had an

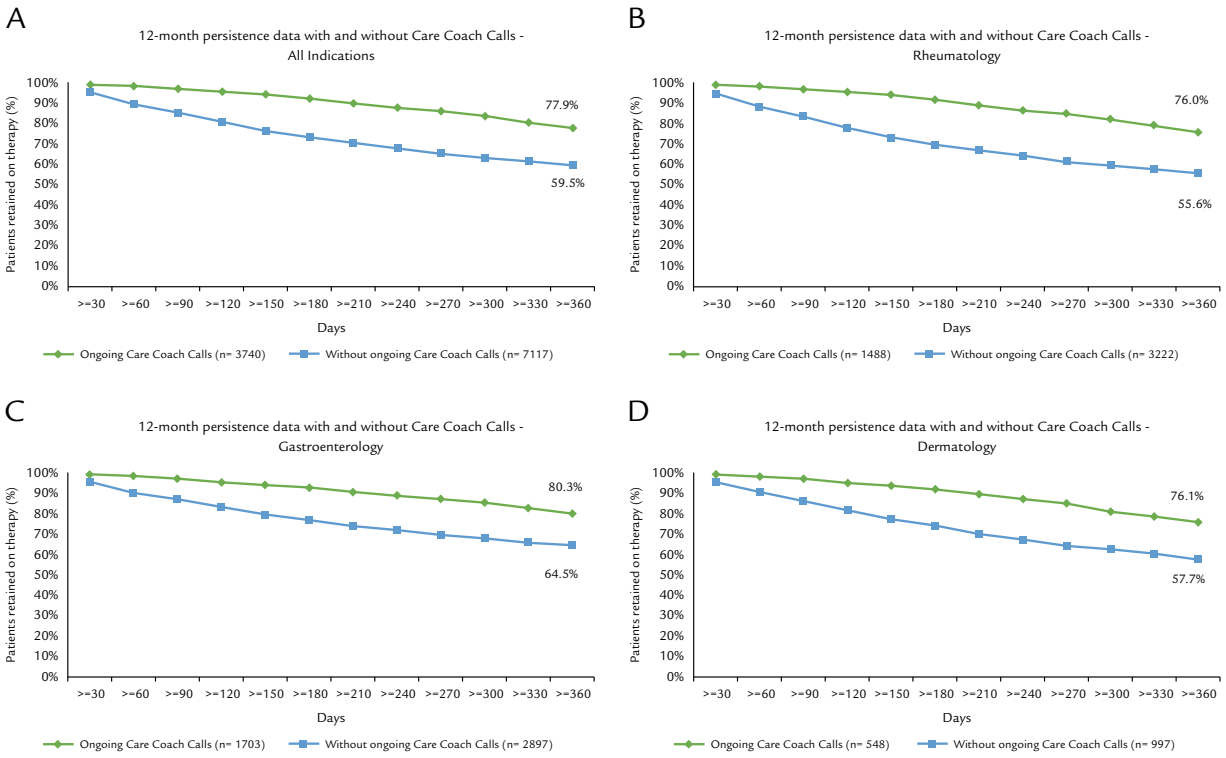

Figure 3. Comparison of 12-month persistence rates between patients who received CCCs and those who did not receive CCCs, across all indications (A), rheumatology cohort (B), gastroenterology cohort (C), and dermatology cohort (D). All cohorts, $P < 0.001$ (Pearson χ^2 test).

average MPR of 67.4% (SD, 21%), 71.5% (SD, 21%) and 69.2% (SD 20.9%) when treated for rheumatologic, gastroenterological and dermatologic conditions, respectively (Table II). Comparison of mean MPR between patients who received CCCs and those who did not receive CCCs, across all indications (70.9% vs 68.6%; $P < 0.001$), and within the rheumatology (68.8% vs 66.8%; $P < 0.01$), gastroenterology (72.6% vs 70.8%; $P < 0.01$), and dermatology (71.1% vs 68.1%; $P < 0.01$) cohorts, is demonstrated in Table II.

Factors Associated With Persistence With and Adherence to Adalimumab Therapy

The association between individual PSP services, including initial and ongoing CCCs and persistence and adherence, was evaluated using multivariate analyses with adjustment for baseline patient characteristics. These results are summarized in Tables III and IV, respectively.

Demographics

Male patients enrolled in the PSP had a 20% lower risk for ADA discontinuation/nonpersistence than did females. Males also demonstrated a greater likelihood of being adherent. The youngest patients (0–17 years) demonstrated a 56% lower risk for ADA discontinuation/nonpersistence than did patients aged 30 to 39 years. Age was also associated with adherence; older age groups had a significantly greater likelihood of being adherent.

Patients in Ontario and eastern Canada demonstrated a higher risk for ADA discontinuation/nonpersistence than did those in Quebec. Patients in Quebec had a significantly higher likelihood of being adherent than did those in all other regions.

Coverage Profile

The association between coverage profile, including public, private, or both, and persistence with and adherence to ADA after adjustment for baseline characteristics was evaluated. Payer coverage was

Table II. Comparison of mean MPR and MPR ≥80% between patients who received CCCs and those who did not receive CCCs, across all indications, and within the rheumatology, gastroenterology, and dermatology cohorts.

	All patients			CCC Cohort			No CCC Cohort			
Indication	N	Mean	SD	N	Mean	SD	N	Mean	SD	p-value**
Overall*	10,441	69.4%	20.9%	3710	70.9%	20.2%	6731	68.6%	21.2%	<0.0001
Rheumatology	4,510	67.4%	21.0%	1476	68.8%	20.3%	3034	66.8%	21.3%	<0.01
Gastroenterology	4,438	71.5%	20.5%	1689	72.6%	19.7%	2749	70.8%	21.0%	<0.01
Dermatology	1,491	69.2%	20.9%	544	71.1%	20.7%	947	68.1%	21.0%	<0.01

	All patients			CCC Cohort			No CCC Cohort			
Indication	N	MPR ≥ 80%	%	N	MPR ≥ 80%	%	N	MPR ≥ 80%	%	p-value***
Overall*	10,441	4,469	42.8%	3,710	1,692	45.6%	6,731	2,777	41.3%	<0.001
Rheumatology	4,510	1,780	39.5%	1,476	631	42.8%	3,034	1,149	37.9%	0.01
Gastroenterology	4,438	2,067	46.6%	1,689	815	48.3%	2,749	1,252	45.5%	0.08
Dermatology	1,491	622	41.7%	544	246	45.2%	947	346	39.7%	<0.05

*Some patients included in "Overall" do not have an indicated specialty
**p-value of the Wilcoxon Rank Sum
***p-value of Chi-square test

found to be significantly associated with ADA discontinuation/nonpersistence, with patients having both public and private coverage demonstrating a 46% decreased risk for discontinuation of therapy than publicly funded patients alone (HR = 0.542; CI, 0.465–0.631; $P < 0.001$), while patients with no coverage demonstrated 77% greater risk for discontinuation than those patients who were publicly funded (HR = 3.774; CI, 3.031–4.7; $P < 0.001$). No significant differences in discontinuation/nonpersistence rates were noted between privately funded patients when compared with publicly funded patients. Patients with both private and public coverage demonstrated a 20% greater likelihood of being adherent than publicly funded patients only (OR = 1.203; CI, 1.008–1.435; $P = 0.0401$). No significant differences in adherence rates were noted between privately funded patients and patients with no coverage when compared with publicly funded patients (data not shown).

Therapy Profile

Patients with RA, PsO, and SpA had lower persistence than did patients with CD; patients with RA, PsO, and SpA had 39%, 39%, and 31% increased risks for ADA discontinuation/nonpersistence relative to patients with CD, respectively. Similarly, patients with RA demonstrated a 29% decreased likelihood of being adherent in comparison with patients with CD, while patients with SpA demonstrated a 25% decreased likelihood of being adherent in comparison with patients with CD.

Patients on concurrent methotrexate therapy had a 26% decreased risk for discontinuation/nonpersistence in comparison with those patients on ADA alone. Patients with prior biologic exposure had a 20% increased risk for discontinuation/nonpersistence in comparison with those previously naive to biologic therapy. Concurrent methotrexate and prior biologic use did not have a significant association with adherence with ADA.

The type of device used for ADA injection, including pen, pediatric vial, or prefilled syringe, had no significant association with patient persistence. However, patients using prefilled syringes were found to have a 15% lower likelihood of being adherent than did those using the ADA pen.

PSP Services

The initial CCC (received prior to therapy initiation) was not associated with persistence, after adjustment for other patient characteristics. Initial CCCs were also not associated with adherence. However, patients who

Table III. Results of Cox regression analyses to estimate hazard ratios (HRs) for the association between discontinuation/nonpersistence and covariates, including patient characteristics and Patient Support Program services, including care coach calls (CCCs) (n = 10,856).

Characteristic	No. (%)	*P*	HR (95% CI)
Sex			
Female*	5988 (55)	–	–
Male	4868 (45)	<0.0001	0.8010 (0.748–0.857)
Age at index			
0–17 y	148 (1)	<0.0001	0.4420 (0.297–0.658)
18–29 y	1130 (10)	0.2743	1.0740 (0.945–1.222)
30–39 y*	1882 (17)	–	–
40–49 y	2248 (21)	0.0228	0.8830 (0.793–0.983)
50–59 y	2584 (24)	0.163	0.9280 (0.836–1.031)
60–69 y	1871 (17)	0.0657	0.8980 (0.8–1.007)
70+ y	994 (9)	0.1246	0.8930 (0.773–1.032)
Region			
Prairies	1906 (18)	0.3024	1.0590 (0.95–1.18)
ON	4313 (40)	<0.0001	1.3640 (1.243–1.497)
QC*	2889 (27)	–	–
East	1749 (16)	<0.0001	1.3210 (1.183–1.475)
Diagnosis			
CD*	4230 (39)	–	–
HS	42 (<1)	0.5767	1.1770 (0.664–2.089)
UC	347 (3)	0.5516	1.0630 (0.87–1.297)
PsO	1513 (14)	<0.0001	1.3860 (1.246–1.54)
RA	2067 (19)	<0.0001	1.3920 (1.263–1.535)
SpA	2499 (23)	<0.0001	1.3060 (1.194–1.429)
Other	159 (1)	0.0247	1.3450 (1.038–1.742)
Concurrent MTX			
No*	8795 (81)	–	–
Yes	684 (6)	<0.0001	0.7350 (0.636–0.849)
Not specified	1378 (13)	0.5196	0.9340 (0.758–1.15)
Previous biologics†			
No*	7097 (65)	–	–
Yes	3116 (29)	<0.0001	1.2030 (1.118–1.294)
Not specified	644 (6)	0.2597	0.6440 (0.3–1.384)
Injection device			
Pen*	8343 (77)	–	–
Pediatric vial	43 (<1)	0.4059	1.2980 (0.702–2.402)
Prefilled syringe	2016 (19)	0.0792	1.0790 (0.991–1.175)
Not specified	455 (4)	<0.0001	1.6830 (1.462–1.939)
Initial CCC during persistent period			
Yes	2938 (27)	0.1924	1.0680 (0.967–1.179)
No*	7919 (73)	–	–
Ongoing CCCs prior or during persistent period			
Yes	3740 (34)	<0.0001	0.2820 (0.257–0.308)
No*	7117 (66)	–	–

CD = Crohn disease; HS = hidradenitis suppurativa; MTX = methotrexate; ON = Ontario; PsO = psoriasis; QC = Quebec; RA = rheumatoid arthritis; SpA = spondyloarthropathies; UC = ulcerative colitis.
*Reference category.
†Infliximab and etanercept.

Table IV. Results of multivariate logistic regression analyses to estimate odds ratios (ORs) for the association between being adherent (medication possession ratio ≥80%) and covariates, including patient characteristics and PSP services, including CCCs (n = 10,440).

Characteristic	No. (%)	*P*	OR (95% CI)
Sex			
Female*	5737 (55)	–	–
Male	4703 (45)	0.0095	1.13 (1.03–1.234)
Age at index			
0–17 y	147 (1)	0.7479	1.08 (0.687–1.686)
18–29 y	1085 (10)	0.8141	1.02 (0.853–1.224)
30–39 y*	1805 (17)	–	–
40–49 y	2161 (21)	0.0013	1.27 (1.097–1.463)
50–59 y	2495 (24)	0.0028	1.24 (1.077–1.43)
60–69 y	1798 (17)	0.0001	1.35 (1.158–1.582)
70+ y	949 (9)	0.0003	1.44 (1.180–1.753)
Region			
Prairies	1831 (18)	<0.0001	0.33 (0.291–0.38)
ON	4113 (39)	<0.0001	0.11 (0.098–0.128)
QC*	2812 (27)	–	–
East	1684 (16)	<0.0001	0.11 (0.097–0.131)
Diagnosis			
CD*	4080 (39)	–	–
HS	41 (>1)	0.0084	2.64 (1.283–5.44)
UC	334 (3)	0.0509	1.3 (0.999–1.68)
PsO	1462 (14)	0.1321	0.9 (0.776–1.034)
RA	1971 (19)	<0.0001	0.71 (0.622–0.818)
SpA	2402 (23)	<0.0001	0.75 (0.668–0.85)
Other	150 (1)	0.9814	1.00 (0.684–1.449)
Concurrent MTX			
No*	8456 (81)	–	–
Yes	677 (6)	0.6183	1.05 (0.871–1.262)
Not specified	1307 (13)	<0.0001	3.6 (2.734–4.747)
Previous biologics†			
No*	6858 (66)	–	–
Yes	2957 (28)	0.843	1.01 (0.912–1.119)
Not specified	625 (6)	0.4586	0.61 (0.169–2.232)
Injection device			
Pen*	8029 (77)	–	–
Pediatric vial	43 (<1)	0.4366	0.74 (0.340–1.594)
Prefilled syringe	1938 (19)	0.0067	0.85 (0.757–0.956)
Not specified	430 (4)	0.001	0.69 (0.547–0.859)
Initial CCC during persistent period			
Yes	2825 (27)	0.7246	1.03 (0.892–1.178)
No*	7615 (73)	–	–
Ongoing CCCs prior or during persistent period			
Yes	3710 (36)	<0.0001	1.49 (1.333–1.67)
No*	6730 (64)	–	–

CD = Crohn disease; HS = hidradenitis suppurativa; MTX = methotrexate; ON = Ontario; PsO = psoriasis; QC = Quebec; RA = rheumatoid arthritis; SpA = spondyloarthropathies; UC = ulcerative colitis.
*Reference category.
†Infliximab and etanercept.

Table V. Rate of treatment-initiation abandonment, by Patient Support Program enrollment year and exposure to coach care calls (CCCs). Data are given as no. (%) of nonstarters.

CCC Exposure	2013*	2014*	2015*
All PSP patients	597/6972 (8.6)	716/8056 (8.9)	494/8874 (5.6)
Initial CCC	252/3889 (6.5)	445/5989 (7.4)	291/7648 (3.8)
No initial CCC	345/3083 (11.2)	271/2067 (13.1)	203/1226 (16.6)

*$P < 0.0001$.

received ongoing CCCs (received after therapy initiation) during the study period had a 72% lower risk for ADA discontinuation/nonpersistence than did those patients who did not receive the ongoing CCCs. Similarly, patients who received ongoing CCCs had 49% greater likelihood of being adherent than those who did not. No statistically significant associations were found on the impact of other PSP services on ADA discontinuation/nonpersistence, including financial assistance (HR = 1.064; CI, 0.851–1.331; $P = 0.5862$), injection training (HR = 0.855; CI, 0.667–1.096; $P = 0.2175$), and pharmacy type, with network pharmacy as a reference (non-network: HR = 1.019; CI, 0.84–1.236; $P = 0.8478$; specialty: HR = 1.05; CI, 0.825–1.335; $P = 0.6916$). Similarly, no statistically significant associations were found on the impact of financial assistance (OR = 1.028; CI, 0.771–1.372; $P = 0.8506$) and injection training (OR = 1.034; CI, 0.729–1.467; $P = 0.8523$) on ADA adherence. In comparison to patients using network pharmacies, patients who used non-network pharmacies had a 60% lower likelihood of being adherent (OR = 0.401; CI, 0.311–0.517; $P < 0.0001$), while patients using specialty pharmacies had a 83% higher likelihood of being adherent (OR = 1.834; CI, 1.31–2.568; $P = 0.0004$).

Therapeutic Area–specific Analyses

As this study included patients treated across multiple indications, separate multivariate models were created for rheumatologic, gastroenterologic, and dermatologic subgroups. In all therapeutic areas, the risk for ADA discontinuation was lower and the likelihood of being adherent was greater among patients receiving ongoing CCCs (see **Supplemental Tables I–VI** in the online version at https://doi.org/10.1016/j.clinthera.2018.02.001).

Nonstart Patients and Rate of Treatment-initiation Abandonment

Patients who registered in PSP but who did not initiate treatment with ADA after receiving a prescription were identified (Table V). The nonstart rate among patients who received an initial CCC was compared to that in patients who did not receive an initial CCC, and enrolled between 2013 and 2015. The receipt of an initial CCC, introduced in 2013, was dependent on the availability of nurses and on the ability to reach the patient before he or she started ADA. In nonstart patients, the rates of treatment-initiation abandonment were 6.5% (2013), 7.4% (2014), and 3.8% (2015) among patients who received an initial CCC, and 11.2% (2013), 13.1% (2014), and 16.6% (2015) among patients who did not receive and an initial CCC. The rate of treatment-initiation abandonment was significantly greater in patients who did not receive an initial CCC Table V ($P < 0.0001$). Furthermore, the rate of treatment-initiation abandonment was higher in patients with PsO (12%) and in patients residing in Ontario (9%) than in the overall cohort (7%) (data not shown).

DISCUSSION

This is the first study to evaluate the impact of PSP CCCs on persistence with and adherence to ADA therapy in Canada by way of linkage to longitudinal prescription data from clinical practice. Results demonstrated a positive association between ongoing CCCs and patient persistence with and adherence to ADA over the first 12 months of observation. Also, the rate of treatment-initiation abandonment was significantly higher in patients who were enrolled in the PSP but did not receive an initial CCC.

The present results are consistent with those of previous studies examining the impact of initiatives similar to some of the individual components of the PSP on medication adherence. For example, electronic reminders have been demonstrated to approximately double the likelihood of medication adherence in patients with chronic disease,[22] and in-person, nurse-led, consultation-based interventions have been shown to increase adherence to oral glucose-lowering medication in patients with type 2 diabetes.[23] In addition, a national community pharmacy service in which patients starting a new medicine for a long-term condition were supported through ongoing face-to-face consultations with their community pharmacists yielded significantly more numbers of patients adhering to their new medication.[24] Similar findings were reported in a cohort of patients with RA on an injectable medication who were enrolled in a therapy-management program.[25] In another study, Stockl et al[26] invited patients with multiple sclerosis to participate in an enhanced disease therapy–management program to improve adherence and maximize quality of life. Participants received clinician telephone consultations, care plan mailings, and educational material mailings for up to 6 months. Participants had significantly higher adherence to an injectable medication and a lower rate of relapse than did patients attending a community pharmacy.[26]

Our findings also contribute to a recently published targeted systematic review that evaluated the impact of PSPs on adherence and on clinical, humanistic, and economic patient outcomes.[27] The study showed that the most frequent clinical outcome impacted by PSPs was adherence, with 27 of 41 studies (66%) reviewed reporting a positive outcome.[27] This targeted review also suggested that 2 or more interventions were more likely to be successful than a single intervention for positive adherence.

This study also identified patient characteristics and PSP services that are associated with persistence and adherence to ADA therapy. The observation that males were significantly more persistent and adherent is in line with findings from Curkendall et al,[28] who studied the persistence and adherence with biologic disease-modifying antirheumatic drugs using claims data from 2285 patients with RA starting either etanercept or ADA. Female sex was associated with lower adherence in adjusted analysis. With respect to age, Viller et al[29] reported greater adherence among older patients in their 3-year longitudinal cohort of patients with RA. Older age groups (40–49, 50–59, 60–69, and 70+ years) were also found to be significantly more adherent to ADA therapy in the present study.

Our results demonstrated that patients having both public and private coverage were at decreased risk for discontinuation of therapy than were publicly funded patients alone, while patients with no coverage demonstrated a greater risk for discontinuation than did those patients who were publicly funded. Patients with both private and public coverage demonstrated greater likelihood of adherence than did publicly funded patients only. Our results are in line with Canada's hybrid health care system, where most health care services in are administered and reimbursed at the provincial level under a single-payer system. While subgroups of the population have public drug coverage, the majority must rely on supplemental private insurance.[30]

Study Implications

The association between ongoing CCCs with ADA adherence suggests that participation in PSP may generate meaningful improvements in the health of patients with IMIDs. Increased medication adherence can improve physical function and work productivity.[25] Previous research has also demonstrated that patients with RA who are adherent to biologic therapy have lower health care resource utilization and lower steroid use compared with those who are nonadherent.[31]

Study Limitations

The study had several limitations. First, records of patients in the LRx were linked to the PSP database using common variables—thus matching ~40% of patients with a low rate of false-positives of mismatched patients—and the positive predictive value of the algorithms ranged from 95.84% to 99.77%. Second, although not common, patients obtaining ADA from multiple pharmacies could have multiple occurrences in the LRx database. Third, pharmacy data do not contain patient-level measurements of clinical effectiveness or adverse events leading to discontinuation of treatment. Fourth, the offering of specific PSP services was not randomized and may have depended on patient characteristics not captured by model covariates. In addition, study outcomes such as medication persistence and adherence were

evaluated for only 12 months after the index date, and results may not necessarily be representative of longer-term follow-up. Lastly, this study is subject to limitations attributed to all retrospective cohort designs, including the inability to fully adjust for bias and confounders and establishing cause-and-effect relationships.

Future Directions

This is the first study to explore the relationships among patient characteristics, PSP services, and persistence with and adherence to ADA therapy in Canada. Still, there remains much to be learned about the effects of PSP on patient-reported outcomes. Kirwan et al[32] suggested that a broader set of outcomes domains be measured in the assessment of PSPs. Future analyses should also consider health-related quality of life, work productivity, and physical functioning. Studies have demonstrated a correlation between persistence and adherence and improved clinical outcomes.[7,10,11] Further research is required to better understand the exact impact of PSP services and persistence and adherence on clinical outcomes for this patient population. Future studies are also planned to quantify the association between receiving CCCs and persistence with and adherence to ADA therapy over a longer-term period, and to evaluate the association between other PSP services including injection services, reimbursement assistance, and patient education, in combination, and medication adherence and persistence. Rigorous economic analyses that consider the consequences of PSP on health care resource utilization are also needed.

CONCLUSIONS

Given the complexity of managing IMIDs and the consequences of poor persistence with and adherence to biologic treatments on patient outcomes and health care costs, a free-to-patient PSP was implemented to assist ADA-treated patients with medication costs, nurse support, injection training, pen disposal, and medication reminders. The results of this study demonstrated that ongoing CCCs, as part of the PSP, were significantly associated with improved patient persistence and adherence over the first 12 months of treatment. These results may inform planning of PSP interventions beyond basic injection training and reimbursement assistance and may improve treatment persistence, adherence, and patient outcomes.

ACKNOWLEDGMENTS

Financial support for the study was provided by AbbVie. Project management, data analysis, and medical writing and editorial support were funded by AbbVie.

The authors acknowledge Dr. Muhammad Mamdani, Department of Health Policy, Management, and Evaluation, University of Toronto, and Centre for Health care Analytics Research and Training, St. Michael's Hospital, for providing expertise regarding the data linking methodology used in this study. Project-management support for this study was provided by Jennifer Glass, PhD, QuintilesIMS. Data-analytical support was provided by Michael Sung, QuintilesIMS. Medical writing and editorial support were provided by Jelena Ivanovic, PhD, QuintilesIMS. AbbVie participated in the design of the study, interpretation of data, review, and approval of this publication.

All of the authors contributed to the development of the publication and maintained control over the final content.

CONFLICTS OF INTEREST

Dr. John Marshall has served as a speaker for AbbVie, Allergan, Ferring, Janssen, Procter & Gamble, Shire, and Takeda. He has also served as a consultant for AbbVie, Allergan, Astra-Zeneca, Boehringer-Ingelheim, Celgene, Celltrion, Ferring, Hospira, Janssen, Merck, Pfizer, Procter & Gamble, Shire, and Takeda. Dr. Louis Bessette has served as a speaker for AbbVie, Amgen, BMS, Janssen, Roche, UCB, Pfizer, Merck, Celgene, Eli Lilly, and Novartis and as a consultant for AbbVie, Amgen, Bristol-Myers Squibb, Janssen, Roche, UCB, Pfizer, Celgene, Eli Lilly, and Novartis. He also collaborated to research with AbbVie, Amgen, Bristol-Myers Squibb, Janssen, Roche, UCB, Pfizer, Merck, Celgene, Sanofi, Eli Lilly, and Novartis. Dr. Carter Thorne has served as a speaker for Medexus/Medac and as a consultant for AbbVie, Amgen, Celgene, Centocor, Genzyme, Hospira, Janssen, Eli Lilly, Medexus/Medac, Merck, Novartis, Pfizer, and Sanofi. He also collaborated to research with Abbvie, Amgen, Celgene, CaREBiodam, Eli Lilly, Novartis, and Pfizer. Dr. Neil Shear has served as a

consultant and/or speaker for AbbVie, Actelion, Biogen IDEC, Celgene, Janssen, Eli Lilly, Sanofi, Genzyme, Hospira a Pfizer Company, Novartis, and Takeda. Sebastien Gerega, Brad Millson, and Driss Oraichi, PhD, are employees of QuintilesIMS and have collaborated on this study as consultants paid by AbbVie. Tania Gaetano, Sandra Gazel, Martin G. Latour, PhD, and Marie-Claude Laliberté, PhD, are employees of AbbVie and own AbbVie shares. The authors have indicated that they have no other conflicts of interest with regard to the content of this article.

SUPPLEMENTARY MATERIAL

Supplemental appendices accompanying this article can be found in the online version at http://dx.doi.org/10.1016/j.clinthera.2018.02.001.

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SUPPLEMENTARY MATERIAL

Supplemental Tables I–VI.

Supplemental Tables I. Determinants of adalimumab therapy persistence across in patients treated for a rheumatologic condition.

Patient Characteristics	Patients (N, %)		p Value	HR	95% CI
Sex					
Female*	2,800	59%	–	–	–
Male	1,910	41%	0.0027	0.85	0.771 - 0.947
Age at Index					
0 – 17	78	2%	0.0005	0.37	0.207 - 0.644
18 – 29	293	6%	0.3242	0.89	0.716 - 1.117
30 – 39*	614	13%	–	–	–
40 – 49	866	18%	<.0001	0.71	0.601 - 0.845
50 – 59	1,242	26%	0.0141	0.82	0.704 - 0.961
60 – 69	1,012	21%	0.0034	0.78	0.657 - 0.92
70+	605	13%	0.1054	0.85	0.695 - 1.035
Region					
Prairies	780	17%	0.6222	1.04	0.889 - 1.217
ON	2,001	42%	0.0002	1.29	1.128 - 1.472
QC*	1,285	27%	–	–	–
East	644	14%	0.0006	1.33	1.13 - 1.563
Diagnosis					
SpA	2,499	53%	–	–	–
Other	114	2%	0.6737	1.07	0.786 - 1.453
Ps	30	1%	0.7997	1.07	0.617 - 1.87
RA	2,067	44%	0.0868	1.1	0.987 - 1.219
Concomitant MTX					
No*	3,633	77%	–	–	–
Yes	496	11%	<.0001	0.7	0.592 - 0.831
Not Specified	581	12%	0.0418	1.55	1.016 - 2.374
Previous Biologics – Remicade ® & Enbrel ©					
No*	3,290	70%	–	–	–
Yes	1113	24%	0.0011	1.2	1.077 - 1.346
Not Specified	307	7%	0.1133	0.43	0.154 - 1.219
Injection Device					
Pen*	3,452	73%	–	–	–
Pediatric Vial	34	1%	0.1873	1.63	0.79 - 3.343
Pre-filled Syringe	1,018	22%	0.1388	1.09	0.972 - 1.23
Not Specified	206	4%	<.0001	1.61	1.307 - 1.979
Initial CCC during Persistent Period					
Yes	1,305	28%	0.173	1.1	0.958 - 1.268
No*	3,405	72%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	1,488	32%	<.0001	0.26	0.226 - 0.296
No*	3,222	68%	–	–	–

*Reference Category

Supplemental Tables II. Determinants of adalimumab therapy adherence across in patients treated for a rheumatologic condition.

Patient Characteristics	Patients (N, %)		p Value	OR	95% CI
Sex					
Female*	2,675	59%	–	–	–
Male	1,835	41%	0.0476	1.16	1.002 - 1.337
Age at Index					
0 – 17	78	2%	0.5706	1.22	0.613 - 2.432
18 – 29	273	6%	0.4135	1.15	0.819 - 1.624
30 – 39*	584	13%	–	–	–
40 – 49	832	18%	<.0001	1.66	1.297 - 2.127
50 – 59	1,197	27%	<.0001	1.6	1.264 - 2.021
60 – 69	972	22%	0.0003	1.59	1.234 - 2.036
70+	574	13%	0.0001	1.77	1.318 - 2.378
Region					
Prairies	737	16%	<.0001	0.4	0.323 - 0.488
ON	1,904	42%	<.0001	0.12	0.1 - 0.149
QC*	1,250	28%	–	–	–
East	619	14%	<.0001	0.12	0.091 - 0.149
Diagnosis					
SpA	2,402	53%	–	–	–
Other	108	2%	0.0766	1.49	0.958 - 2.329
Ps	29	1%	0.2799	1.58	0.69 - 3.611
RA	1,971	44%	0.4315	0.94	0.807 - 1.096
Concomitant MTX					
No*	3,464	77%	–	–	–
Yes	491	11%	0.5128	1.08	0.86 - 1.352
Not Specified	555	12%	0.0004	2.49	1.503 - 4.127
Previous Biologics – Remicade ® & Enbrel ©					
No*	3,161	70%	–	–	–
Yes	1051	23%	0.063	0.85	0.718 - 1.009
Not Specified	298	7%	0.6655	0.64	0.087 - 4.77
Injection Device					
Pen*	3,310	73%	–	–	–
Pediatric Vial	34	1%	0.7009	0.83	0.324 - 2.133
Pre-filled Syringe	971	22%	0.0064	0.79	0.664 - 0.935
Not Specified	195	4%	0.0005	0.54	0.377 - 0.76
Initial CCC during Persistent Period					
Yes	1,255	28%	0.7689	1.03	0.838 - 1.27
No*	3,255	72%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	1,476	33%	<.0001	1.61	1.357 - 1.918
No*	3,034	67%	–	–	–

*Reference Category

Supplemental Tables III. Determinants of adalimumab therapy persistence across in patients treated for a gastroenterological condition.

Patient Characteristics	Patients (N, %)		p Value	HR	95% CI
Sex					
Female*	2,525	55%	–	–	–
Male	2,074	45%	<.0001	0.8	0.717 - 0.892
Age at Index					
0 – 17	64	1%	0.0214	0.5	0.276 - 0.902
18 – 29	771	17%	0.0626	1.18	0.991 - 1.411
30 – 39*	1,035	23%	–	–	–
40 – 49	1,042	23%	0.9297	1.01	0.857 - 1.183
50 – 59	927	20%	0.7787	1.02	0.866 - 1.212
60 – 69	534	12%	0.5	0.93	0.759 - 1.144
70+	226	5%	0.1253	0.79	0.587 - 1.067
Region					
Prairies	933	20%	0.2809	1.1	0.924 - 1.311
ON	1,629	35%	<.0001	1.52	1.295 - 1.779
QC*	1,271	28%	–	–	–
East	766	17%	0.0002	1.42	1.178 - 1.702
Diagnosis					
CD	4,229	92%	–	–	–
Other	23	1%	0.5304	0.77	0.345 - 1.731
UC	347	8%	0.6299	1.05	0.855 - 1.295
Concomitant MTX					
No*	3,864	84%	–	–	–
Yes	156	3%	0.1217	0.77	0.552 - 1.072
Not Specified	579	13%	0.0013	0.62	0.46 - 0.827
Previous Biologics – Remicade ® & Enbrel ©					
No*	2,761	60%	–	–	–
Yes	1,602	35%	0.0003	1.24	1.101 - 1.385
Not Specified	236	5%	0.4532	0.63	0.192 - 2.087
Injection Device					
Pen*	3,678	80%	–	–	–
Pediatric Vial	8	0%	0.9986	1	0.236 - 4.221
Pre-filled Syringe	719	16%	0.9694	1	0.861 - 1.168
Not Specified	194	4%	<.0001	1.82	1.46 - 2.277
Initial CCC during Persistent Period					
Yes	1,203	26%	0.9994	1	0.845 - 1.184
No*	3,396	74%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	1,703	37%	<.0001	0.31	0.264 - 0.355
No*	2,896	63%	–	–	–

*Reference Category

Supplemental Tables IV. Determinants of adalimumab therapy adherence across in patients treated for a gastroenterological condition.

Patient Characteristics	Patients (N, %)		p Value	OR	95% CI
Sex					
Female*	2,428	55%	–	–	–
Male	2,009	45%	0.2911	1.08	0.939 - 1.232
Age at Index					
0 – 17	63	1%	0.5881	1.2	0.627 - 2.276
18 – 29	747	17%	0.8635	0.98	0.775 - 1.238
30 – 39*	1,000	23%	–	–	–
40 – 49	999	23%	0.4345	1.08	0.885 - 1.327
50 – 59	895	20%	0.4621	1.08	0.877 - 1.333
60 – 69	516	12%	0.0148	1.36	1.062 - 1.742
70+	217	5%	0.0592	1.41	0.987 - 2.014
Region					
Prairies	906	20%	<.0001	0.32	0.258 - 0.386
ON	1,555	35%	<.0001	0.1	0.081 - 0.125
QC*	1,239	28%	–	–	–
East	737	17%	<.0001	0.11	0.09 - 0.142
Diagnosis					
CD	4,080	92%	–	–	–
Other	23	1%	0.7943	0.88	0.332 - 2.323
UC	334	8%	0.0511	1.31	0.999 - 1.723
Concomitant MTX					
No*	3,736	84%	–	–	–
Yes	154	3%	0.9378	0.99	0.678 - 1.431
Not Specified	547	12%	<.0001	4.9	3.294 - 7.296
Previous Biologics – Remicade ® & Enbrel ©					
No*	2,679	60%	–	–	–
Yes	1,528	34%	0.1101	1.13	0.973 - 1.309
Not Specified	230	5%	0.8214	0.8	0.118 - 5.452
Injection Device					
Pen*	3,546	80%	–	–	–
Pediatric Vial	8	0%	0.5353	0.61	0.124 - 2.953
Pre-filled Syringe	701	16%	0.9064	1.01	0.836 - 1.223
Not Specified	182	4%	0.1607	0.78	0.557 - 1.102
Initial CCC during Persistent Period					
Yes	1,156	26%	0.7579	0.97	0.776 - 1.203
No*	3,281	74%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	1,689	38%	0.0004	1.37	1.148 - 1.624
No*	2,748	62%	–	–	–

*Reference Category

Supplemental Tables V. Determinants of adalimumab therapy persistence across in patients treated for a dermatologic condition.

Patient Characteristics	Patients (N, %)		p Value	HR	95% CI
Sex					
Female*	662	43%	–	–	–
Male	882	57%	<.0001	0.66	0.558 - 0.786
Age at Index					
0 – 17	5	0%	0.9672	0.96	0.126 - 7.295
18 – 29	66	4%	0.9076	1.03	0.637 - 1.66
30 – 39*	232	15%	–	–	–
40 – 49	339	22%	0.7072	0.95	0.715 - 1.256
50 – 59	415	27%	0.5446	0.92	0.693 - 1.214
60 – 69	324	21%	0.7747	1.04	0.78 - 1.396
70+	163	11%	0.8272	0.96	0.659 - 1.395
Region					
Prairies	191	12%	0.5354	1.11	0.806 - 1.514
ON	681	44%	0.0082	1.4	1.09 - 1.785
QC*	333	22%	–	–	–
East	339	22%	0.0777	1.29	0.973 - 1.697
Diagnosis					
Ps*	1,482	96%	–	–	–
HS	42	3%	0.1826	0.66	0.359 - 1.216
Other	20	1%	0.5196	1.25	0.631 - 2.489
Concomitant MTX					
No*	1,295	84%	–	–	–
Yes	32	2%	0.5842	0.85	0.475 - 1.522
Not Specified	217	14%	0.5318	1.18	0.699 - 2.003
Previous Biologics – Remicade ® & Enbrel ©					
No*	1,043	68%	–	–	–
Other	501	32%	0.0814	1.19	0.978 - 1.458
Injection Device					
Pen*	1,212	78%	–	–	–
Pre-filled Syringe	278	18%	0.0924	1.22	0.968 - 1.531
Not Specified	54	3%	0.0225	1.62	1.071 - 2.456
Initial CCC during Persistent Period					
Yes	430	28%	0.2774	1.16	0.886 - 1.522
No*	1,114	72%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	548	35%	<.0001	0.26	0.203 - 0.327
No*	996	65%	–	–	–

*Reference Category

Supplemental Tables VI. Determinants of adalimumab therapy adherence across in patients treated for a dermatologic condition.

Patient Characteristics	Patients (N, %)		p Value	OR	95% CI
Sex					
Female*	633	42%	–	–	–
Male	857	58%	0.2124	1.17	0.913 - 1.508
Age at Index					
0 – 17	5	0%	0.1313	0.14	0.011 - 1.805
18 – 29	65	4%	0.512	0.79	0.394 - 1.59
30 – 39*	221	15%	–	–	–
40 – 49	329	22%	0.6224	1.11	0.737 - 1.665
50 – 59	403	27%	0.933	1.02	0.68 - 1.521
60 – 69	309	21%	0.3562	1.22	0.8 - 1.86
70+	158	11%	0.5618	1.17	0.686 - 2.002
Region					
Prairies	186	12%	<.0001	0.2	0.128 - 0.299
ON	653	44%	<.0001	0.08	0.056 - 0.116
QC*	323	22%	–	–	–
East	328	22%	<.0001	0.09	0.057 - 0.128
Diagnosis					
Ps*	1,432	96%	–	–	–
HS	41	3%	0.0035	3.2	1.467 - 6.977
Other	17	1%	0.6079	0.73	0.224 - 2.397
Concomitant MTX					
No*	1,254	84%	–	–	–
Yes	32	2%	0.8311	0.91	0.385 - 2.152
Not Specified	204	14%	<.0001	6.65	3.259 - 13.569
Previous Biologics – Remicade & Enbrel					
No*	1,016	68%	–	–	–
Other	475	32%	0.7043	0.95	0.704 - 1.267
Injection Device					
Pen*	1,172	79%	–	–	–
Pre-filled Syringe	265	18%	0.0221	0.67	0.48 - 0.945
Not Specified	53	4%	0.4762	0.78	0.384 - 1.563
Initial CCC during Persistent Period					
Yes	414	28%	0.2378	1.28	0.85 - 1.92
No*	1,076	72%	–	–	–
On-going CCCs Prior or During Persistent Period					
Yes	544	37%	0.0121	1.51	1.094 - 2.083
No*	946	63%	–	–	–

*Reference Category