**Supplemental Table 1:** Codes used to operationalize cohort selection criteria

|  |  |
| --- | --- |
| **Exposures** | **Codes** |
| Ustekinumab | Stelara  NDCs: 57894006003, 57894005427, 57894006002, 57894006103  HCPCS: C9487, J3357, J3358, Q9989 |
| Vedolizumab | Entyvio  NDCs: 64764030020  HCPCS: J3380 |

|  |  |
| --- | --- |
| **Anti-TNF inhibitors** | **Brand names** |
| Adalimumab | Humira |
| Golimumab | Cimzia  Cimzia Powder for Reconst  Cimzia Starter Kit |
| Certolizumab pegol | Simponi  Simponi ARIA |
| Infliximab (infliximab, infliximab-abda, infliximab-axxq, infliximab-dyyb) | Remicade  Renflexis  Avsola  Inflectra |

**Supplemental Table 2:** Codes used to operationalize study outcomes

|  |  |
| --- | --- |
| **Study outcomes** | **Diagnosis and/or procedure codes** |
| Surgery related to Crohn’s disease | ICD-10-PCS  0D1A\*\*Q, 0D1B\*\*Q, 0D1B\*\*4, 0D1N0Z4, 0D1N4Z4, 0DB8\*\*\*, 0DBA\*\*\*, 0DBB\*\*\*, 0DBC\*\*\*, 0DBE\*\*\*, 0DBF\*\*\*, 0DBG\*\*\*, 0DBH\*\*\*, 0DBJ\*\*\*, 0DBK\*\*\*, 0DBL\*\*\*, 0DBM\*\*\*, 0DBN\*\*\*, 0DBP\*\*\*, 0DBQ0ZZ, 0DBQ3ZZ, 0DBQ4ZZ, 0DQ8\*\*\*, 0DQ90ZZ, 0DQA\*\*\*, 0DQB\*\*\*, 0DQE\*\*\*, 0DQH\*\*\*, 0DQN\*\*\*, 0DQP\*\*\*, 0DQQ\*\*\*, 0DT8\*\*\*, 0DTA\*\*\*, 0DTB\*\*\*, 0DTC\*\*\*, 0DTE\*\*\*, 0DTF\*\*\*, 0DTG\*\*\*, 0DTH\*\*\*, 0DTJ\*\*\*, 0DTK\*\*\*, 0DTL\*\*\*, 0DTM\*\*\*, 0DTN\*\*\*, 0DTP\*\*\*, 0WQFXZ2  HCPCS Level I, CPT-4 Category 1  43845, 44020, 44111, 44120, 44121, 44125, 44130, 44139, 44140, 44141, 44143, 44144, 44145, 44146, 44147, 44150, 44151, 44155, 44156, 44157, 44158, 44160, 44186, 44187, 44188, 44202, 44203, 44204, 44205, 44206, 44207, 44208, 44210, 44211, 44212, 44213, 44300, 44310, 44312, 44314, 44316, 44322, 44640, 44650, 44900, 44950, 44955, 44960, 44970, 44979, 45110, 45111, 45112, 45113, 45114, 45116, 45121, 45123, 45136, 45395, 45397  HCPCS Level II  G9613, G9659, G9660, G9711 |
| Any malignancy | ICD-10-PCS  C00-D49, excluding D10-D36, D3A, and C44 |
| Cardiac event | ICD-10-CM  I20, I21, I24, I63 |
| Thromboembolic event | ICD-10-CM  I26, I80, I82 |

**Supplemental Table 3:** Codes used to operationalize select baseline characteristics

|  |  |
| --- | --- |
| **Baseline characteristics** | **Diagnosis and/or procedure codes** |
| Anemia | ICD-10-CM  D50, D53.8, D53.9, D63.8, D64.9 |
| Malnutrition | ICD-10-CM  E40-E46, E64, M83.3, O25 |
| *C difficile* testing | HCPCS Level I, CPT-4 Category I  0097U, 0107U, 87230, 87324, 87449, 87493, 87505, 87506, 87507, 87803  HCPCS Level I, CPT-4 Category II  3520F |
| *C difficile* diagnosis | A04.7\* |
| Any endoscopic procedure | ICD-10-PCS  0DJD8ZZ  HCPCS Level I, CPT-4 Category I  00812, 44388, 44389, 44390, 44391, 44392, 44394, 44401, 44402, 44403, 44404, 44405, 44406, 44407, 44408, 45378, 45379, 45380, 45381, 45382, 45384, 45385, 45386, 45388, 45389, 45390, 45391, 45392, 45393, 45398  HCPCS Level I, CPT-4 Category II  0528F, 0529F, 3018F, 3775F, 3776F  HCPCS Level II  G0105, G0120, G0121, G2204, G9612, G9613, G9614, G9659, G9660, G9661, G9933, G9935, G9936, G9937, S0285 |
| Any abdominal imaging | ICD-10-PCS  B420\*\*\*, B42C\*\*\*, B430\*\*\*, B43C\*\*\*, B52F\*\*\*, B52G\*\*\*, B52H\*\*\*, B53H\*\*\*, BD24\*\*\*, BH3H\*\*\*, BR2C\*\*\*, BR3C\*\*\*, BW00\*\*\*, BW01\*\*\*, BW20\*\*\*, BW21\*\*\*, BW24\*\*\*, BW25\*\*\*, BW2G\*\*\* ,BW30\*\*\*, BW3G\*\*\*, BY33\*\*\*,  HCPCS Level I, CPT-4 Category I  72193, 72194, 72195, 72196, 72197, 72198, 74150, 74160, 74170, 74176, 74177, 74178, 74181, 74182, 74183, 74185, 74240, 74246, 74250, 74251, 74270, 74280  HCPCS Level II  C8900, C8901, C8902, C8918, C8919, C8920 |
| Thiopurines | NDC generic names  Azathioprine, azathioprine sodium, mercaptopurine  HCPCS Level II  J750, J7501, S0108 |
| Methotrexate | NDC generic names  Methotrexate sodium, methotrexate sodium/PF, methotrexate, methotrexate/PF  HCPCS Level II  J8610, J9250, J9260 |
| Calcineurin inhibitors | NDC generic names  Cyclosporine, tacrolimus, cyclosporine modified  HCPCS Level II  J7502, J7515, J7516, J7503, J7507, J7508, J7525 |
| Systemic corticosteroids | NDC generic names  Injection route  dexamethasone acetate and sodium, phosphate in sterile water,  dexamethasone acetate in sodium chloride, iso-osmotic,  dexamethasone sodium phosphate,  dexamethasone sodium phosphate/PF,  hydrocortisone sod succinate,  hydrocortisone sodium succinate/PF,  methylprednisolone acetate,  methylprednisolone acetate in sodium chloride,iso-osmotic/PF,  methylprednisolone acetate in sterile water for injection,  methylprednisolone sodium succinate  Oral route  dexamethasone,  hydrocortisone,  methylprednisolone,  prednisolone,  prednisolone acetate,  prednisolone sodium phosphate,  prednisone  HCPCS Level II  4193F, 4194F, G2112, G2113, G9467, G9468, G9469, G9470, J7512, J1020, J1030, J1040, J2650, J2920, J2930, J7509, J7510, J1094, J1100, J8540, J1700, J1710, J1720 |
| Oral budesonide | NDC generic names  Oral route  budesonide |
| Rectal corticosteroids | NDC generic names  Rectal route  budesonide,  hydrocortisone,  hydrocortisone acetate,  hydrocortisone acetate/pramoxine HCl |

**Supplemental Table 4:** Results from sensitivity analysis evaluating treatment discontinuation as the outcome

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Crude new users** | **Crude person-years** | **Crude events** | **Incidence rate per 1000 person-years** | **HR (95% CI) Before weighting** | **HR (95% CI)  After weighting** |
| **Secondary measures of effectiveness** |  |  |  |  |  |  |
| Treatment discontinuation |  |  |  |  |  |  |
| Ustekinumab | 1,217 | 868.28 | 306 | 352.42 | 0.85 (0.71, 1.02) | 0.87 (0.72, 1.05) |
| Vedolizumab | 667 | 479.64 | 198 | 412.81 | (Ref) | (Ref) |

**Supplemental Table 5:** Characteristics of Patients with Crohn’s Disease Initiating Treatment with Vedolizumab or Ustekinumab following anti-TNF Therapy in the SPARC-IBD Cohort\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Characteristic** | **Vedolizumab** | | **Ustekinumab** | |
|  | **n=77** | **%, SD or IQR** | **n=227** | **%, SD or IQR** |
| **Demographics** |  |  |  |  |
| Mean age (SD) | 41.2 | 13.9 | 43.1 | 14.5 |
| Male n (%) | 32 | 41.6 | 88 | 38.8 |
| Race n (%) |  |  |  |  |
| African | 7 | 9.1 | 23 | 10.1 |
| Asian | 0 | 0.0 | 1 | 0.4 |
| White | 62 | 80.5 | 184 | 81.1 |
| Alaskan Native | 0 | 0.0 | 1 | 0.4 |
| Mixed | 1 | 1.3 | 5 | 2.2 |
| Other | 0 | 0.0 | 1 | 0.4 |
| Declined/Unknown | 0 | 0.0 | 0 | 0.0 |
| Ethnicity n (%) |  |  |  |  |
| Declined/Unknown | 1 | 1.3 | 14 | 6.2 |
| Hispanic or Latino | 8 | 10.4 | 4 | 1.8 |
| Not Hispanic or Latino | 68 | 97.1 | 209 | 97.7 |
|  |  |  |  |  |
| **Crohn's disease phenotype** |  |  |  |  |
| Location n (%) |  |  |  |  |
| ileum and colon | 44 | 57.1 | 135 | 59.5 |
| ileum without colon | 9 | 11.7 | 34 | 15.0 |
| colon without ileum | 10 | 13.0 | 24 | 10.6 |
| Missing | 14 | 18.2 | 33 | 14.5 |
| Upper GI disease n (%) | 2 | 2.6 | 14 | 6.2 |
| Behavior n (%) |  |  |  |  |
| Non-penetrating, non-stricturing | 26 | 33.8 | 74 | 32.6 |
| Penetrating and stricturing | 14 | 18.2 | 68 | 30.0 |
| Stricturing | 22 | 28.6 | 77 | 33.9 |
| Penetrating | 13 | 16.9 | 32 | 14.1 |
| Missing | 2 | 2.6 | 24 | 10.6 |
| Perianal disease phenotype | 12 | 15.6 | 34 | 15.0 |
|  |  |  |  |  |
| ***Prior Medications*** |  |  |  |  |
| Mean number of prior anti-TNF (SD) | 1.6 | 0.7 | 1.6 | 0.8 |
| Prior use of 6MP/aza/MTX within 365 d, n (%) | 29 | 37.7 | 112 | 49.3 |
| Prior use of 6MP/AZA (ever) n (%) | 18 | 23.4 | 71 | 31.3 |
| Prior use of MTX (ever) n (%) | 21 | 27.3 | 84 | 37.0 |
| Prior use of tacrolimus/cyclosporine (ever) n (%) | 1 | 1.3 | 12 | 5.3 |
| Taking oral steroids within 90 days prior to index date n (%) | 25 | 32.5 | 102 | 44.9 |
|  |  |  |  |  |
| **BMI**: mean of measures w/in 90 days on/before index (SD) | 29.5 | 23.8 | 26.3 | 5.0 |
| **Smoking status (most recent prior to index)** |  |  |  |  |
| Yes | 4 | 5.2 | 8 | 3.5 |
| No | 44 | 57.1 | 90 | 39.7 |
| Missing | 29 | 37.7 | 129 | 56.8 |
|  |  |  |  |  |
| **Disease activity assessments** |  |  |  |  |
| Short Crohn's Disease Activity Index |  |  |  |  |
| Maximum in 3 months prior to index date (mean, SD)\* | 147.1 | 103.1 | 164.6 | 105.5 |
| Maximum in 6 months prior to index date (mean, SD)\*\* | 143.9 | 98.2 | 164.2 | 102.9 |
| Most recent prior to index date (mean, SD)\*\*\* | 140.4 | 90.9 | 128.6 | 95.8 |
|  |  |  |  |  |
| Simplified Endoscopic Score for Crohn's Disease |  |  |  |  |
| Maximum in 3 months prior to index date (maximum of recorded)^ | 10.3 | 9.6 | 6.6 | 5.1 |
| Maximum in 6 months prior to index date (maximum of recorded)^^ | 9.5 | 7.8 | 6.6 | 5.0 |
|  |  |  |  |  |
| ***Laboratory results within 90 days for subset with lab data*** |  |  |  |  |
| Albumin╞ | 4.0 | 0.5 | 4.0 | 0.5 |
| Hematocrit╞╞ | 38.4 | 4.4 | 38.2 | 5.2 |
| CRP╞╞╞ | 0.9 | 2.4 | 1.0 | 2.5 |

\* Vedolizumab n=33; Ustekinumab n=96

\*\* Vedolizumab n=49; Ustekinumab n=149

\*\*\* Vedolizumab n=64; Ustekinumab n=192

^ Vedolizumab n=12; Ustekinumab n=19

^^ Vedolizumab n=20; Ustekinumab n=28

╞ Vedolizumab n=47; Ustekinumab n=147

╞╞ Vedolizumab n=38; Ustekinumab n=128

╞╞ ╞ Vedolizumab n=26; Ustekinumab n=102

\*To assess for the potential for unmeasured confounding by disease characteristics that could not be measured in the commercial claims data, we identified a cohort of patients meeting the same inclusion criteria within the Study of a Prospective Adult Research Cohort with IBD (SPARC IBD), which is part of the Crohn’s & Colitis Foundation’s IBD Plexus research exchange. The details of the SPARC IBD cohort have been previously described.1 Briefly, SPARC IBD is a prospective cohort study conducted at 17 centers throughout the United States. Data are collected at enrollment, at the time of office visits, lower endoscopy and by quarterly surveys.

1. Raffals LE, Saha S, Bewtra M, et al. The Development and Initial Findings of A Study of a Prospective Adult Research Cohort with Inflammatory Bowel Disease (SPARC IBD). Inflamm Bowel Dis 2022;28:192-199.